

principles to overcome heretofore insurmountable obstacles. To discover a solution to a long standing problem represents a long standing patentability standard of unobviousness. To discover an unobvious solution to an age-old perplexing problem under conditions which yield unexpectedly superior tenaciousness in engaging and retrieving a grounded tennis ball without destroying the tennis ball pile cover provides further clear evidence of patentability and would, in itself, rebut any alleged prima facie case of obviousness. When the prior art resoundly repeatedly states that what applicant has accomplished cannot be accomplished, it is not fair to conclude that there exists a reasonable expectation of success or that the solution would have been obvious. If it was so obvious, why does the art repeatedly say it cannot be done?

The references relied upon in any 35USC103(a) rejection must, by themselves, fairly teach and suggest the obviousness of the claimed invention. There is no suggestion that a unique and highly specific nylon monofilament of a very narrow and tight tolerance of recited characteristics has a unique and unexpected ability to retrieve grounded tennis balls without destroying the ball as does the prior art steel wire VELCRO which forms the crux of Examiner's rejection. When it becomes necessary to abstractly theorize or speculate or infer untaught or un contemplated subject matter as forming a factual basis for any of the cited references in 35USC103(a) rejections, the need to rely upon applicant's unobvious discovery and findings in order to hindsightedly reconstruct the prior art in view of applicant's disclosure becomes self evident and further reveals the highest order of hindsightedness reconstruction of the claimed invention.

There also is error in assuming that the mating component of the mating cooperative combination of complex chemical entities will independently perform the same function in the absence of its other mate. Within the hook and loop field, there exists a vast differences in

chemical composition, orientation, structure, crystallization, manufacturing conditions (e.g. quantum of heat, tension, size, rigidity, resiliency, compatibility with its mate and its manufacture, etc.) as evident by the Exhibits now of record and in the patent application.

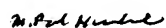
Applicant had also made of record U.S. Patent 6,652,397 B1 to William J. Lamson (which patent was filed after applicant's parent application and examined by the same examiner of this application) for its summary of the artisan's knowledge (e.g. see Cols 1, 2 and 3, lines 113). How Lamson views the state of the art does not differ from what applicant has extensively argued on two appeals herein. Lamson chose to use the adhesive backing of the hook and loop combination to adhesively engage the tennis ball because he knew of the inadequacies of the hook as clearly acknowledged by Lamson. Most unexpectedly, applicant has discovered that a highly specialized and very narrowly defined hook material (amongst a host of others and unbeknownst to others) possess a most unexpectedly unique character in cooperative combination with a tennis ball pile which all others have repeatedly concluded was not possible. This is precisely why Lamson and all others sought other means to retrieve a grounded tennis ball. The old art (which the Examiner relies upon) hinges upon stainless steel hooks which as reported by the subsequent prior art artisans was known to tenaciously cling onto the tennis ball pile so that when the steel hook was pulled apart from the tennis ball, the hook pulled the wool pile cover from the ball. The unique hook material which applicant discovered has exceptional compatibility with the pile so as to entangle and engage onto the pile (e.g. see Rule 132 Affidavit) and yet a springiness and resiliency in hook character so as to unhook from the tennis ball pile without damaging it. This is unique. To find a uniquely different combination amongst a host of unworkable hook materials as confirmed by the prior art of record, represents under any 35USC103(a) standard an unobvious invention. The MPEP (2110-107) guidelines are in

complete harmony with applicant's steadfast position that the invention as currently claimed defines novel and unobvious subject matter under 35USC103.

Applicant requests the Examiner reconsider and to fully assess the gapping art gaps existing in the prior art as applied against the rejected claims and allow all of the claims by reason of the inadequacy of the prior art teachings. If it is necessary to go again before the Board of Appeals, applicant respectfully requests that these remarks and Exhibits submitted herewith be made a part of the appeal record.

Dated this 23<sup>rd</sup> day of August, 2006.

Respectfully submitted,



M. Paul Hendrickson  
Attorney for Applicant  
Registration No. 24523

Post Office Box 508  
Holmen, Wisconsin 54636-0508

Phone: 608-526-4422  
Fax: 608-526-2711

## APPENDIX

### EXHIBIT B

#### Pages B1-B10

Exemplary listing of hook and loop product and processing patents.

Patents - Few of many hundreds

#### U.S. Patent No.

2,717,437	3,009,235	3,241,881
3,313,511	3,027,566	3,338,291
2,933,797	2,976,914	3,328,081
3,485,529	3,279,008	3,147,527
3,154,837	3,196,490	3,136,026
3,546,754	3,550,223	3,550,837
3,562,044	3,562,770	3,577,607
3,586,060	3,594,863	3,594,865
3,595,059	3,629,032	3,665,584
3,673,301	3,695,976	3,708,382
3,715,415	3,732,604	3,735,468
3,781,398	3,801,245	3,943,981
4,024,003	3,405,430	3,527,001
3,913,183	4,041,549	4,169,303
4,290,174	4,615,084	4,617,214
3,594,873	5,349,991	5,515,583
6,202,264	3,031,730	3,138,841
3,147,528	3,138,841	3,147,528
3,192,589	3,261,069	3,607,995
3,718,725	3,770,359	3,785,012
3,808,301	3,808,648	3,900,652
4,454,183	4,628,709	

and many, many more.

U.S. Patent No. 4,910,062 - Exemplary teachings.

First Sentence "Background Art": The art is replete with sheet materials that can be cut into smaller pieces to form portions of fasteners, and methods for making such sheet materials. U.S. Pat. Nos. 2,933,797; 3,009,235; 3,136,026; 3,154,837; 3,577,067; 3,673,301; 3,943,981; and 4,024,003 provide illustrative examples.

**USPTO PATENT FULL-TEXT AND IMAGE DATABASE**

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Searching All Years...























Results of Search in All Years db for:  
hook AND "loop fastener": 5215 patents.  
Hits 1 through 50 out of 5215

Exemplary of  
remaining 5215 Hits



Refine Search	hook AND "loop fastener"
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PAT. NO.	Title
1 6,453,525	Double-bow shoe lace device
2 6,453,493	Covers for support pillows
3 6,453,475	Convertible visor/cap with a plurality of crown supports
4 6,453,204	Magnetic electrode for delivering energy to the body
5 6,451,405	Oil tarp assembly for heavy machinery
6 6,451,239	Process of making a hook fastener using radio frequency heating
7 6,450,944	Acceleration protective suit
8 6,450,895	Golf practice device with adjustable golf ball tee platform and adjustable leg stance platform
9 6,450,168	Infant sleeping blanket/garment for use with medical devices
10 6,450,131	Forward bending motion control harness
11 6,449,881	Detachable shoe wallet
12 6,449,777	Child-proof eyewear retainer strap assembly
13 6,449,770	Restraining garment device
14 6,448,742	Low profile battery pack with aircraft power provisions
15 6,447,362	Rotating musical remote control mobile device with detachable toys
16 6,447,353	Toddler/adult float jacket
17 6,447,165	Shipping container that can be stiffened
18 6,446,994	Bicycle fender system
19 6,446,852	Belt assembly for storage and inventory of tools
20 6,446,831	System for dispensing aprons
21 6,446,751	Apparatus and method for reducing noise levels
22 6,446,688	Carry bag with pouch insert and cover
23 6,446,577	Insulated cover for portable kennel
24 6,446,361	Transformable slipper toy
25 6,446,269	Concealed lower body garment support belt
26 6,443,986	Self-forming prosthetic device and method of making the same
27 6,443,805	Bra shelf and application thereof
28 6,443,787	Flying ski

- 29 6,443,655  Flood barrier
- 30 6,443,617  Resealable sack or bag
- 31 6,443,525  Vehicle seat assembly and fastening device
- 32 6,443,499  Apparatus for pre-conditioned air hoses and a method of assembling pre-conditioned air
- 33 6,443,415  Computer monitor organizer assembly
- 34 6,443,407  Accessory tray for a tripod
- 35 6,443,335  Rapid comestible fluid dispensing apparatus and method employing a diffuser
- 36 6,443,297  Pulley lagging with hook and loop fastener attachment system
- 37 6,443,187  Aligning woven loop elements to form mounting sleeves
- 38 6,443,101  Pet apparel with leash
- 39 6,442,889  Insect and animal traps and holder for same
- 40 6,440,526  Non-slip pad
- 41 6,439,958  Breast saver comfort
- 42 6,439,733  Removable helmet light system
- 43 6,439,637  Golf cart cover
- 44 6,439,537  Forming mold with recess having snap-fit end seal
- 45 6,439,432  Personal safety device
- 46 6,439,314  Aqua boot for horses
- 47 6,439,221  Method and apparatus for providing a portable preassembled grill
- 48 6,439,167  Pet collar for use with pet containment system
- 49 6,439,152  Device for marking the path along the ground of a rolling wheel
- 50 6,438,900  Storage chamber
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United States Patent  
Yoshida

4,646,397  
March 3, 1987

Surface-type fastener

**Abstract**

A surface-type fastener comprising a pair of fabric fastener strips, one fastener strip having on its one surface a number of *hook*-shaped engaging elements engageable with a number of loop-shaped engaging elements on one surface of the other fastener strip. One surface of each fastener strip has a first region in which the engaging elements are disposed, and a second region devoid of engaging elements. The other surface of the individual fastener strip has, in registry with the first region, an area covered with synthetic resin.

Inventors: Yoshida; Hiroshi (Kurobe, JP)  
Assignee: Yoshida Kogyo K. K. (Tokyo, JP)  
Appl. No.: 744255  
Filed: June 13, 1985

**Foreign Application Priority Data**

Jun 18, 1984[JP]

59-90592[U]

**Current U.S. Class:**

24/442; 24/443; 24/448

**Intern'l Class:**

A44B 013/00

**Field of Search:**

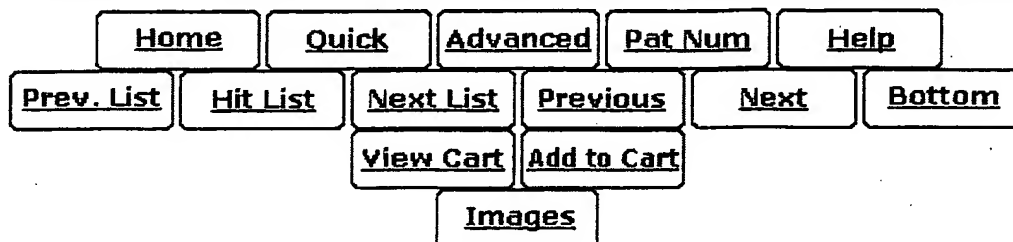
24/442,443,444,445,446,447,448,451,452,426 2/DIG. 6 112/265.1,406

**References Cited [Referenced By]****U.S. Patent Documents**

<u>3009235</u>	Nov., 1961	de Mestral	24/445.
<u>3136026</u>	Jun., 1964	de Mestral	24/445.
<u>3383738</u>	May., 1968	Fox et al.	2/DIG.
<u>3464094</u>	Sep., 1969	Mates	24/443.
<u>3525376</u>	Aug., 1970	Muhlhauser	24/442.
<u>3537108</u>	Nov., 1970	Daniels	2/DIG.
<u>3849840</u>	Nov., 1974	Yamada et al.	24/448.
<u>4089068</u>	May., 1978	Swallow	2/DIG.
<u>4139133</u>	Feb., 1979	Repka	2/DIG.
<u>4165555</u>	Aug., 1979	Boxer et al.	24/444.
<u>4212052</u>	Jul., 1980	Chambard	2/DIG.

**Foreign Patent Documents**

2153599	Aug., 1973	DE	24/442.
57-15684	Apr., 1982	JP.	
57-27289	Jun., 1982	JP.	

**USPTO PATENT FULL-TEXT AND IMAGE DATABASE**

( 5019 of 5215 )

United States Patent  
Erb

4,615,084  
October 7, 1986

Multiple *hook* fastener media and method and system for making

**Abstract**

Multiple *hook*-fastener media in which many protruding hooks are formed at relatively high speed from suitable bendable and settable plastic material which may be different from the substrate to which these pre-formed hooks are subsequently bonded. Many rows of hooks are formed simultaneously, each row from a strand, for example, a monofilament of longitudinally oriented polymeric material. The formed strands are "set" into their multiple *hook* row configuration, and then these pre-formed rows of hooks are simultaneously bonded to the substrate. Thus, an attractive substrate of any reasonable width, for example, of three inches, six inches, a foot or a yard, may be used. The production method and system enable the number of hooks per square inch, either longitudinally or laterally or both, to be adjusted while running. The shank of each *hook* includes two legs, and the production method and machine can be adjusted while running for making hooks with crossed legs, uncrossed legs or divergent legs for achieving varieties of configurations and characteristics, as desired for various applications. Advantageously, the production can be changed for making taller or shorter hooks and for making hooks with differently shaped arcuate ends by exchanging one pair of meshing (interdigitating) shaping belts for another. The substrate material may be woven or unwoven and may comprise multiple layers including metal or plastic layers or both. The substrate with mounted hooks can be slit longitudinally for producing many *hook*-fastener tapes at relatively fast overall lineal speed. Consequently, the *hook*-fastener media of this invention with their various sizes, shapes, widths and characteristics, fabricated by relatively low-cost, high-speed production hold promise of becoming widely available, widely used, commodity-type products which will find their way into myriads of applications of benefit to human beings in years to come.

Inventors: Erb; George H. (Cuttingsville, VT)  
Assignee: Erblok Associates (Charlottesville, VA)  
Appl. No.: 643001  
Filed: August 21, 1984

Current U.S. Class: 24/442; 24/306; 156/66; 264/296; 428/93; 428/100; 428/369  
Intern'l Class: A44B 018/00  
Field of Search: 24/306,442,445 156/66 264/235,296 428/93,100,369

**References Cited [Referenced By]****U.S. Patent Documents**

<u>3147528</u>	Sep., 1964	Erb.	
<u>3196490</u>	Jul., 1965	Erb.	
<u>3527629</u>	Sep., 1970	Wylde	428/93.
<u>3546754</u>	Dec., 1970	Erb.	
<u>3550223</u>	Dec., 1970	Erb.	
<u>3550837</u>	Dec., 1970	Erb	229/45.
<u>3562044</u>	Feb., 1971	Erb	156/155.
<u>3562770</u>	Feb., 1971	Erb.	
<u>3586060</u>	Jun., 1971	Erb	139/46.



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United States Patent  
Higashinaka

4,920,617  
May 1, 1990

Separable fastener

**Abstract**

Described herein is a male fastener strip having a multitude of hooking elements on one side of substrate cloth, which is characterized in that the individual hooking elements are spaced from adjacent hooking elements by X(mm) and Y(mm) in the transverse and longitudinal directions of the fastener strip, respectively, such that X is between 2.0 and 4.0 mm, inclusive and X/Y is in the range of 0.5 to 3.5.

Inventors: Higashinaka; Yukitoshi (Iruma, JP)  
Assignee: Kuraray Company, Ltd. (Kurashiki, JP)  
Appl. No.: 266329  
Filed: November 1, 1988

**Foreign Application Priority Data**

Jul 30, 1986[JP]

61-181154

**Current U.S. Class:**

24/442; 24/446; 24/450

**Intern'l Class:**

A44B 018/00

**Field of Search:**

24/442,446,452,449,445,443,444

**References Cited [Referenced By]****U.S. Patent Documents**

<u>3405430</u>	Oct., 1968	Sidelman	24/450.
<u>3527001</u>	Sep., 1970	Kleemeier et al.	24/446.
<u>3913183</u>	Oct., 1975	Brumlik	24/442.
<u>4041549</u>	Aug., 1977	Atkinson	24/450.
<u>4169303</u>	Oct., 1979	Lemelson	24/446.
<u>4290174</u>	Sep., 1981	Kalleberg	24/444.
<u>4615084</u>	Oct., 1986	Erb	24/442.
<u>4617214</u>	Oct., 1986	Billarant	24/444.

**Foreign Patent Documents**

<u>754602</u>	Oct., 1970	BE	24/442.
<u>9037852</u>	Oct., 1981	EP.	
<u>2476564</u>	Feb., 1987	EP	24/442.
<u>1610318</u>	Oct., 1970	DE.	
<u>3244410</u>	Oct., 1983	DE.	
<u>1580822</u>	May., 1968	FR.	

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United States Patent  
Higashinaka, et al.

6,386,242  
May 14, 2002

**Hook** fastener member to minimize damage to loops**Abstract**

A flexible **hook** fastener member having a **hook** density of 80 to 200 per cm.sup.2 and causing little damage to cooperating loop fastening elements. The loops for forming **hook** fastening elements are produced by thin monofilaments having a fineness of 100 to 200 deniers. The monofilament for forming the **hook** fastening elements are in reverse phase relation to the adjacent ground warps with respect to the ground wefts.

Inventors: Higashinaka; Yukitoshi (Fukui-ken, JP); Itoh; Hiroshi (Osaka-fu, JP)  
Assignee: Kuraray Co., Ltd. (Kurashiki, JP)  
Appl. No.: 618844  
Filed: July 18, 2000

**Foreign Application Priority Data**

Jul 30, 1999[JP]

11-216238

**Current U.S. Class:**

139/391; 24/445

**Intern'l Class:**

A44B 018/00

**Field of Search:**

24/445 139/384 B,391

**References Cited [Referenced By]****U.S. Patent Documents**

<u>3594873</u>	Jul., 1971	Hockmeyer, Jr.	139/391.
<u>5349991</u>	Sep., 1994	Okawa et al.	139/391.
<u>5515583</u>	May., 1996	Higashinaka	24/446.
<u>6202264</u>	Mar., 2001	Ishihara	24/445.

**Foreign Patent Documents**

6-52521	Jul., 1994	JP.
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**Primary Examiner:** Falik; Andy**Attorney, Agent or Firm:** Oblon, Spivak, McClelland, Maier & Neustadt, P.C.**Claims**

What is claimed is:

1. A **hook** fastener member with damage to the to cooperating loop fastening elements minimized, comprising:

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United States Patent  
Provost, et al.

5,953,797  
September 21, 1999

**Hook** fasteners and methods of manufacture**Abstract**

A **hook** fastener member having rows of molded **hook**-shaped fastener elements that lie in planes aligned with the rows, with generally planar plate portions at the outermost ends of at least some of the fastener elements, the plate portions lying generally parallel to the base of the fastener member. The plate portions can enhance engagement of the **hook** fastener members with mating **loop fastener** members, particularly with low loft non-woven **loop fastener** members. A method of making fastener members is provided. Molten resin is extruded and applied to a molding roller, creating preforms. The outermost portions of at least some of the preforms are flattened, thereby forming generally plate shaped portions. Disposable absorbent garments advantageously incorporate the **hook** fastener members.

Inventors: Provost; George A. (Litchfield, NH); Condon; Mark J. (Melrose, MA); Leak; A. Todd (Neenah, WI); Roslansky; Apiromraj S. (Little Chute, WI); Serbiak; Paul J. (Appleton, WI)  
 Assignee: Velcro Industries B.V. (Curacao, NL)  
 Appl. No.: 731061  
 Filed: October 9, 1996

Current U.S. Class:

24/452; 24/304; 24/442; 24/446

Intern'l Class:

A44B 018/00

Field of Search:

24/452, 442, 445, 446, 448, 304

**References Cited [Referenced By]**

U.S. Patent Documents			
<a href="#">3031730</a>	May., 1962	Morin	24/452.
<a href="#">3138841</a>	Jun., 1964	Naimer	24/204.
<a href="#">3147528</a>	Sep., 1964	Erb	24/204.
<a href="#">3192589</a>	Jul., 1965	Pearson	24/204.
<a href="#">3261069</a>	Jul., 1966	Mathison	24/204.
<a href="#">3607995</a>	Sep., 1971	Chiba	264/15.
<a href="#">3718725</a>	Feb., 1973	Hamano	264/163.
<a href="#">3770359</a>	Nov., 1973	Hamano	425/305.
<a href="#">3785012</a>	Jan., 1974	Billarant	24/204.
<a href="#">3808301</a>	Apr., 1974	Pruden	24/80.
<a href="#">3808648</a>	May., 1974	Billarant et al.	
<a href="#">3900652</a>	Aug., 1975	Uraya et al.	428/92.
<a href="#">4169303</a>	Oct., 1979	Lemelson	24/452.
<a href="#">4290174</a>	Sep., 1981	Kalleberg	24/204.
<a href="#">4454183</a>	Jun., 1984	Wollman	428/92.
<a href="#">4628709</a>	Dec., 1986	Aeschbach et al.	

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United States Patent

D457,053

Akeno, et al.

May 14, 2002

**Hook element piece for *hook-and-loop fastener*****Claims**The ornamental design for a *hook* element piece for *hook-and-loop fastener*, as shown and described.

Inventors: Akeno; Mitsuru (Kurobe, JP); Minato; Tsuyoshi (Toyama-ken, JP)

Assignee: YKK Corporation (Tokyo, JP)

Appl. No.: 101309

Filed: February 26, 1999

**Foreign Application Priority Data**

Sep 02, 1998[JP]

10-25157

Current U.S. Class:

D8/382

Intern'l Class:

0805/

Field of Search:

D8/382 24/452,442,448,444,453

**References Cited [Referenced By]****U.S. Patent Documents**

<a href="#">5067210</a>	Nov., 1991	Kayaki	24/442.
<a href="#">D367419</a>	Feb., 1996	Murasaki	D8/382.
<a href="#">D374813</a>	Oct., 1996	Akeno	D8/382.
<a href="#">D376533</a>	Dec., 1996	Akeno	D8/382.

Primary Examiner: Baynham; Holly

Attorney, Agent or Firm: Hill &amp; Simpson

**Description**FIG. 1 is a front view of a *hook* element piece for a *hook-and-loop fastener*.FIG. 2 is a top plan view of the *hook* element piece of FIG. 1.FIG. 3 is a right side view of the *hook* element piece of FIG. 1.FIG. 4 is a base view of the *hook* element piece of FIG. 1.

FIG. 5 is a cross-sectional view taken on line 5-5 of FIG. 2; and,

FIG. 6 is a fragmentary perspective view of the *hook* element piece of FIG. 1.

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United States Patent  
Provost, et al.

4,654,246  
March 31, 1987

**Self-engaging separable fastener****Abstract**

A self-engaging separable fastener is disclosed which comprises a base member of woven separable fastener material having at least two adjacent mating fastener sections. At least one section is defined by a plurality of loops upstanding from the base member, and the other section is defined by a plurality of hooks upstanding from the base member. The loops are formed of respective generally parallel rows of multifilament yarns interwoven into their respective base section so as to repeat the same loop direction and construction every predetermined number of picks and the hooks are cut from respective generally parallel rows of loops of monofilament yarns interwoven into their respective base section so as to repeat their loop direction and construction every predetermined number of picks, which latter number of picks is greater than the number of picks in which the direction of the multifilament loops is repeated. The density of the monofilament hooks is less than the density of the multifilament loops such that the sections of fastener material may be placed in face-to-face engagement by folding one section over the other and pressing the surfaces together and separated by peeling forces normal to the interfacial plane of engagement. Preferably the loops repeat themselves every four picks and the hooks repeat themselves every eight picks.

Inventors: Provost; George (Manchester, NH); Ouellette; Marcel C. (Bedford, NH)  
Assignee: Actief, N.V. (Curaco, AN)  
Appl. No.: 772591  
Filed: September 5, 1985

Current U.S. Class: 428/88; 26/2R; 26/8C; 26/8R; 26/29R; 428/100  
Intern'l Class: B32B 003/06  
Field of Search: 428/88,92,100 139/2 28/214 26/2 R,8 R,8 C,29 R 156/72

**References Cited [Referenced By]**

U.S. Patent Documents			
<u>4058853</u>	Nov., 1977	Boxer et al.	428/100.
<u>4165555</u>	Aug., 1979	Boxer et al.	428/100.

Primary Examiner: McCamish; Marion C.  
Attorney, Agent or Firm: Pennie & Edmonds

**Claims****We claim:**

1. A self-engaging separable fastener which comprises a base member of woven separable fastener material having at least two adjacent mating fastener sections, at least one section defined by a plurality of loop-like engaging elements upstanding from said base member, the other section defined by a plurality of *hook*-type engaging elements upstanding from said base member, said loop-like engaging elements being formed of respective generally parallel rows of loops of multifilament yarns interwoven into their respective base section so as to

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- [Hook & Loop Fasteners](#) (37 Companies)
- [Fasteners: Hook & Loop, Conductive](#) (3 Companies)

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Company Name	Location	Description
<a href="#">Velcro USA Inc.</a>	Manchester , NH	Hook & Loop Fastening Systems For Industrial Applications Where Separation & Rejoining Of Components Is Necessary, Or Where...
<a href="#">Middleburg Thread &amp; Sewing Supply</a>	Warminster , PA	Hook & Loop Fasteners, Sewing Quality, Pressure Sensitive, Heat Activated, Solvent Activated, Polyester, Display Pile....
<a href="#">Fasnap Corp.</a>	Elkhart , IN	Wholesale Distributor Of Snap Fasteners, Turn & Directional Fasteners, Grommets, Panel Fasteners, Metal & Plastic Hardware,...
<a href="#">Toleeto Fasteners International</a>	San Ysidro , CA	Reusable Hook & Loop Cable Ties, Wrist Bands & Custom Fabricated Straps For A Variety Of Applications. Ultrasonic Welding &...
<a href="#">Loktite, Inc.</a>	Timonium , MD	Dist. 3M & Other Hook & Loop Fasteners. Plain Backed, Pressure Sensitive, Dual Lock & Solvent / Heat Activated. Tapes,...
<a href="#">National Webbing Products Co.</a>	Garden City Park , NY	Complete Line Of Hook & Loop In All Widths & Colors. On Spools Or Cut Pieces, Hook & Loop Straps
<a href="#">Levitt Industrial Textile Co.</a>	Hicksville , NY	Dist. Of Velcro® Brand Hook & Loop Tape, Coins & VELCLOTH™ Brand Display Fabric. Special Colors, Widths, Lengths, Cut...
<a href="#">Gleicher Manufacturing Corp., A 3M Distributor</a>	Scotch Plains , NJ	Rotary & Flatbed Die Cutting, Laser Cutting, Clean Room Processing, Tapes, VHB®, Dual Lock®, Bumpons®, A 3M Dist.
<a href="#">Bond Products Inc.</a>	Philadelphia , PA	Suppliers Of Narrow Fabrics, Including Woven Tapes, Hook & Loop Tape & Dots, Drawcord Braids, Webbing, Elastics, Tying...
<a href="#">Bardsco</a>	St. Louis , MO	Reusable Hook & Loop Cable Ties, Wrist Bands & Custom Fabricated Straps For A Wide Variety Of Applications. Ultrasonic...
<a href="#">Touchtape, Inc.</a>	St. Augustine , FL	Standard & PS Hook & Loop Tape & PS Dots Available. In-House Mfg. & Fabrication. Custom Orders
<a href="#">Perfectex Plus LLC</a>	Huntington Beach , CA	Hook & Loop Fasteners. Sew-On Pressure-Sensitive Tapes. Heat & Solvent Activated Tapes. Fire-Retardant. Mil. Spec. Custom...
<a href="#">Action Fabricators</a>	Grand Rapids , MI	Pressure Sensitive Adhesives, Tapes, Rubber Bumpers, Felt Feet & Pads. Die Cutting Of Various Materials. Specialize In...
<a href="#">Speedtech International, Inc.</a>	Chicago , IL	Mfr. & Dist. Of Hook & Loop Fasteners. Stocking VELCRO®, SPEEDWRAP® & Other Brands
<a href="#">WBC Industries, Inc.</a>	Westfield , NJ	Hook & Loop Fasteners
<a href="#">Rip 'N Grip Industries, Inc.</a>	Palmdale , CA	Mfr. & Dist. Of Hook & Loop Fastening Tapes
<a href="#">American Cord &amp; Webbing Co., Inc.</a>	Woonsocket , RI	

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<u>Creative Textiles, Inc.</u>	Torrance , CA	Custom Fabrication To Specs. Sewing, Ultrasonic Sealing, Embroidery, Silk Screening, Die Cutting, Imprinting
<u>Industrial Tape &amp; Supply Co.</u>	Marietta , GA	Complete Line Of Tape & Packaging Supplies Including 500 Varieties Of Pressure Sensitive Tapes, Tape Dispensers, Carton...
<u>Griff Paper &amp; Film</u>	Fallsington , PA	Release Liners For The Pressure Sensitive Fastener Industry. Paper & Film Substrates. Printing Logos A Specialty
<u>T &amp; W Converters, Inc.</u>	Glendale , CA	Tape Die-Cutting, Printing, Slitting, Rewinding & Laminating. In-House Printing Of Carton Sealing & Gummed Tape. Dist. Of...
<u>Adhesives &amp; Tapes Industrial Supply</u>	Vista , CA	Adhesives, Sealants, Coatings, Encapsulants, Tapes & Application Equipment. Casting Resin, Acrylic, Anaerobic,...
<u>Granat Industries, Inc.</u>	Elk Grove Village , IL	Hook & Loop (Sewing Quality - Pressure Sensitive) All Widths In Stock. Thread, Webbing, Plastic & Metal Hardware, Rivets,...
<u>Hang-Ups Unlimited, Div. of Magna-Pole Products, Inc.</u>	Santa Monica , CA	Mfrs. Of Adhesive, Magnetic & Suction Cup Hooks & Mechanical Fasteners For Hanging Promotional & Permanent Indoor Displays,...
<u>FASTENation, Inc.</u>	Passaic , NJ	Dist. & Fabricator Of Hook & Loop Fasteners, 3M Dual Lock

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<a href="#">Can-Do National Tape</a>	Nashville, TN	Pressure Sensitive Tapes For Every Application; Complete Line Of Converting Capabilities & Specialty Tapes; All Widths,...
<a href="#">WCL Company</a>	City Of Industry, CA	Cable Ties & Clamps; Cuff Restraints; T-Clamps; Nail Clips; Hose Clamps; Wire Ducting; Patch Panels
<a href="#">MSC Industrial Supply Co.</a>	Melville, NY	Supplier Of 450,000 Products From 2,500 Mfrs.: Cutting / Machine / Hand / Power Tools, MRO Supplies, Abrasives, Fasteners,...
<a href="#">TekSupply</a>	South Windsor, CT	Wholesale Mfr. & Dist. Serving The Agricultural, Building, Repair & Maintenance Industries: Specializing In ClearSpan <sup>TM</sup> ...
<a href="#">Meyers, A., &amp; Sons Corp.</a>	New York, NY	Hook & Loop, Straps, Cut Pieces. Sew On & Pressure Sensitive. Fibre Optic Bundle Straps
<a href="#">World Fasteners, Inc.</a>	Hampstead, MD	Over 195 Million Fasteners In Stock In All Materials, Sizes & Shapes. Military, Commercial, Fed-Milspec, AN-MS-NAS....
<a href="#">Seton Identification Products</a>	Branford, CT	Hook & Loop
<a href="#">Linal, Inc.</a>	Bristol, CT	Supplier & Mfr. Of Metal Snap Hooks & Snap Closures For Pet Leads, Tents, Marine, Military Specification & A Wide Range Of...
<a href="#">Nielsen / Sessions</a>	Hartford, CT	Global Mfr. Of Latches, Hinges, Handles, Locks & Hardware. Standard & Custom Engineered Applications To Industrial,...
<a href="#">Clements Industries Inc.</a>	South Hackensack, NJ	Mfrs. Of Pressure Sensitive Tape & Label Dispensers, Bag Sealers, Cable Ties, Packaging Machinery, Twist Tie Machines &...
<a href="#">Dienetics, Inc.</a>	Grand Rapids, MI	Die Cut, Stamped & Lasercut Plastic, Rubber, Foam, Cork, Fibre & Adhesive Backed Non-Metallic Materials. Mfr. Of Laser Steel...
<a href="#">Pacific States Felt &amp; Mfg. Co., Inc.</a>	Hayward, CA	Cut To Specs.
<a href="#">HellermaannTyton, A Spirent Co.</a>	Milwaukee, WI	Cable Management Products Including Cable Ties, Clips, Clamps & Other Fasteners
<a href="#">Covert Co., Inc.</a>	Baltimore, MD	Mfg. Adhesive Machinery For Bonding Hook & Loop Material To Plastics & Metals
<a href="#">Gem Office Products Co., LLC</a>	Jacksonville, FL	Paper Clips, Brass & Steel Paper Fasteners, Metal Meat Skewers, Pin Tickets, Thumb Tacks, Pins, Package Handles, Specialty...
<a href="#">HyTech Spring And Machine</a>	Plainwell, MI	Flat Springs, Retainers, Snap Rings, Clamps, Rings, Wire Forms & Any Type Of Helical Springs With Size .002" & Up. Certified...
<a href="#">Converters Inc.</a>	Huntingdon Valley, PA	Specializing In Custom Slitting, Die Cutting & Laminating Of Pressure Sensitive Tapes
<a href="#">Atlantic Gasket Corp.</a>	Philadelphia, PA	Mfr. Of Gaskets, Die-Cut Parts & Fabrications From A Wide Range Of Non-Metallic Materials, Including

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<u>Precision Plastics</u>	Beltsville, MD	Mfr. Of Custom Plastic & Wood, Metal Products & Fabrications Including Vacuum Forming, Thermoforming, Covers, Domes, &...
<u>Advanced Fabricating Technology, Inc.</u>	Grand Rapids, MI	Die Cutting, Fabricating, Stamping, Laminating, Packaging & Screen Printing Of Plastics, Rubber, Adhesives, Foam & Fibre....
<u>Enco Manufacturing Co.</u>	Farmingdale, NY	Metalworking & Woodworking Tools, Machines & Supplies
<u>Diamond Fasteners, Inc.</u>	Farmingdale, NY	Distribute Fasteners & Electronic Hardware. In Stock Military Specs. (AN-MS-NAS), Aerospace / Aircraft Fasteners, Standard /...
<u>Able National Corp.</u>	Brooklyn, NY	Turnkey Contract Mfr. Of All Die Cut Products; Magnets, Filters, Gaskets, Washers, Advertising Specialties; Design, Printing
<u>Alliance</u>	Hot Springs, AR	Designer & Mfr. Of All Varieties Of Rubber Bands For All Applications Including Office, Home, Industry & Produce. Packaging,...

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Company Name	Location	Description
<a href="#">Greene Rubber Co., Inc.</a>	Woburn, MA	Dist. & Fabricators Of Hook & Loop Materials. Strips Or Die Cut Parts To Specification. Dies Made On Premises
<a href="#">Leonard Industrial Supply</a>	Westbury, NY	Complete Line: Hand Tools, Fasteners, 3M Abrasives, Adhesives, Chucks, Cutting Tools (Drills, End Mills, Reamers),...
<a href="#">Century Marketing Corp.</a>	Bowling Green, OH	Plastic Hook, Tachers, Self Fastening. Hang Tags & Garment Bags Also Available
<a href="#">Deccofelt Corporation</a>	Glendora, CA	Converters Of A Wide Range Of Materials Into Adhesive Coated Products. Complete Die-Cutting & Slitting Facilities
<a href="#">Reid Tool Supply Co.</a>	Muskegon, MI	35,000 Items In Stock, No Minimum Order
<a href="#">Robbins Lightning, Inc.</a>	Maryville, MO	Mfrs. Of A Complete Line Of Lightning Protection & Static Grounding Materials Which Comply With The Requirements Of Codes...
<a href="#">A+ Products, Inc</a>	Brooklyn, NY	Stampings, Die Casted, Wire Forms, Split Keyrings, O & D Rings, Suspender, Luggage & Plastic Hardware, Zippers
<a href="#">Diversified Foam Products Inc.</a>	Pennsauken, NJ	Custom Foam Fabrication, Precision Slitting, High Speed Die Cutting, Flame Lamination, Hot Wire & Kiss Cutting. Specializing...
<a href="#">Rapid Rivet &amp; Fastener Corp.</a>	Farmingdale, NY	Master Dist. Of All Types Of Rivets, AN, MS, Commercial. Solid Semi-Tubular Blind, Drive Rivets & Rivet Nuts
<a href="#">Hudson Fasteners, Inc.</a>	Bay Shore, NY	Full Line Mfr., Dist. Fasteners: Screws, Nuts, Bolts, Washers, Hardware, Fastener Assortment Kits. All Grades, Materials &...
<a href="#">Fastening Products Inc.</a>	Laguna Hills, CA	Mfr., Distributor, Importer, & Wholesaler Of Commercial Grade Fasteners For Sale To OEM's. Standard Items Available...
<a href="#">Wayne Bolt &amp; Nut Co.</a>	Detroit, MI	Fasteners: Bolts, Screws, Nuts, Pins, Dowels, Spacers, Fittings. Standards Or Specials From Blue Prints. Ferrous Or Non...
<a href="#">FFr / Fasteners For Retail</a>	Cleveland, OH	Merchandising Systems & Accessories Including Sign Holders, Shelf Management Systems, Ceiling Display Products, Product...
<a href="#">Allied Manufacturers</a>	Corona, CA	Supplier Of Machined Components & Products. Products To Every Industry; From Designers Of Skates To Builders Of Jumbo Jets
<a href="#">P &amp; H Metal Products Corp.</a>	Valencia, CA	Mfr. Of More Than 1500 Luggage / Custom Hardware; Buckles, Hooks, Snaps, Rivets, Rings, Slides, Tie-Downs
<a href="#">Cable Markers Co., Inc.</a>	Lake Forest, CA	Identification Products, Wire Markers, Computer Printable Systems, Labels, Tags, Heat Shrink Sleeving, Serialization, Bar...

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<u>Ampex Metal Products Co.</u>	Cleveland, OH	All Materials & Industries. Four-Slide, Punch Press, Secondary Operations. CAD, SPC. Complete Tool & Die Facilities
<u>Brand Preference Development Co.</u>	St. Louis, MO	Hinges, Hardware, Locks, Latches & Foam Tape, Plastic & Metal Trim
<u>Astrup</u>	Cleveland, OH	Dists. Of Hardware For Awning, Tent & Marine Applications. Also Awning, Sign, Marine, Tarp & Tent Fabrics As Well As...
<u>Clip Strip Corp.</u>	Hackensack, NJ	Mfrs. Of Display Fixtures, Clip Strips, Holders For: Price Channels, Signs, Banners, Cards, Labels
<u>Advanced Cable Ties, Inc.</u>	Gardner, MA	Mfg. & Specializing In Nylon, Stainless Steel, & Hook & Loop Cable Ties, Cable Tie Accessories, Cable Clamps, Cable Wraps,...
<u>Premier Fasteners, Inc.</u>	Farmingdale, NY	Stocking Dist. Of Fasteners; Nuts, Bolts, Rivets, Screws, Washers, & Hardware For Commercial, Industrial & Aerospace Markets
<u>Associated Bag Co.</u>	Milwaukee, WI	Reusable Ties With / Without Buckle In Black. Self-Adhesive Velcro® Coins. Packaging & Shipping Supplies
<u>Allan Zipper Mfg. Corp.</u>	Brooklyn, NY	Nylon Molded & Metal Zippers, Hook & Loop Fasteners, Separators, Closures. Assembler / Distributor
<u>3M Co. / Corp. Mktg. &amp; Public Affai.</u>	St. Paul, MN	Serving Several Markets Including: Automotive, Communication Arts, Construction & Maintenance, Consumer, Electronics /...

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<a href="#">Plitek, LLC</a>	Des Plaines, IL	Specialists In Custom Die Cutting, Slitting, Laminating, Coating, Spooling, Plastic Extrusion & Fabrication Of Precision...
<a href="#">Moore, Howard J., Co., Inc.</a>	Huntington Station, NY	Plastic & Insulating Parts & Material; Rubber Gaskets, Die Cutting, Stamping, Screw Machine Parts
<a href="#">Secon Rubber &amp; Plastics, Inc.</a>	Red Bud, IL	3M Converter, Foam Tapes, Gaskets, Pressure Sensitive Adhesives, Diecutting, Laminating, Slitting, VHB Tapes, Converter &...
<a href="#">New Brunswick Plating, Inc.</a>	New Brunswick, NJ	Plating & Surface Finishing Of Complex Components In The Electronic, Medical & Electrical Industries. Plate On A Large...
<a href="#">Crest Lock Co., Inc.</a>	Brooklyn, NY	Mfr. / Designer Of Specialty Hardware For Transit & Instrument Cases & Trunks, Cabinets, Luggage. Standard & Custom Handles,...
<a href="#">Wirewright Manufacturing</a>	Camarillo, CA	All Types Of Commercial, Industrial, Military Buckles. Products Include D-Rings, Medical Buckles, Plastic Buckles, Snap...
<a href="#">Harper Aerospace</a>	Corona, CA	Fasteners Found In Satellites , Nuclear Applications, Radar Equipment, Turbine Engines & High-Pressure Pumps
<a href="#">Audion Automation, Ltd.</a>	Addison, TX	Mfr. Of Flexible Packaging Systems & Packaging Machinery: Shrink Packaging, Bag Packaging & Skin Packaging. Products...
<a href="#">Breeze Eastern</a>	Union, NJ	Rescue Hoists, Cargo Winches & Hook / Tie-Down Systems For Helicopters, Other Aircraft & Ships
<a href="#">Textol Systems, Inc.</a>	Carlstadt, NJ	Distributor & Fabricator Of Hook & Loop Products
<a href="#">Delafield Fluid Technologies</a>	Duarte, CA	Supplier Industrial Hoses, Including Hose Accessories & Fittings
<a href="#">Vicar International</a>	Union, NJ	Mfrs. Of Snap Fasteners, One Way Fasteners, Baby Snaps, Curtain Fasteners, Turnbuckles, 100% Stainless Steel Snap Fasteners...
<a href="#">Tape Specialists Of Georgia Inc.</a>	Americus, GA	Supplier & Converter Of Pressure Sensitive Tapes, Foams, Diecuts / Extrusions & Packaging Materials. Representing The...
<a href="#">Sutherland Felt Co.</a>	Troy, MI	Mfr., Die Cutting, & Fabricating Felt, Cork, Rubber, Foam, Leather, Hi-Temp materials. Fast Turnaround, Short Runs Welcome
<a href="#">Tapelex Tape Machine Corp.</a>	Ashland, MA	Automatic Or Semi-Automatic High-Speed Tape Applicators For All Types Of Pressure Sensitive Tape With Or Without Liner,...
<a href="#">Ribbon Webbing Corp.</a>	Chicago, IL	Mfrs. Of Polypropylene, Nylon & Polyester Webbing, Also Hook & Loop, Gros Grain. Webbing For All Purposes, In All Colors &...
<a href="#">Warren Bolt &amp; Screw Div., Warren</a>	Detroit, MI	Mfrs. Dowel & Taper Pins, Woodruff Keys, Acorn &

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<u>Screw Works</u>		Weld Nuts, Weld Screws, Long Socket Caps, Specialty Screw
<u>Syst-A-Matic Tool &amp; Design</u>	Meadville, PA	Mfrs. Of Taplicator- Tape Application System: Feeds, Cuts, & Applies Pressure Sensitive Tape; Scrap-Eliminating Process...
<u>Richco, Inc.</u>	Chicago, IL	Plastic Fasteners, Circuit Board Hardware, Wire Routing Products, Cable Ties, Clips & Clamps, Fiber Optic &...
<u>Integrity Fasteners, Inc.</u>	Orange, CA	Dist. Fasteners, AN-MS-NAS, BAC Hardware, Inserts, Nuts, Bolts, Screws, Washers, Fittings, Connectors. Metric & Standards,...
<u>Plasti-Clip Corporation</u>	Milford, NH	Price Channel Sign Holders, Clips, Accessories
<u>D.J. Associates, Inc.</u>	Fort Smith, AR	Miscellaneous Hardware, Webbing & Tapes, Small Quantity Specialists
<u>Barjan Manufacturing Ltd.</u>	Farmingdale, NY	Hook & Loop Fastening Systems For Drapery Systems, Secure Guard™ Systems
<u>American Trade Group, Inc., Left Hand Bolt &amp; Nut Div.</u>	Detroit, MI	Large Inventory Of Finished Left-Hand Hex Head Caps, Socket Caps & Hex Nuts
<u>MULTI TRIM</u>	New York, NY	Mfrs. & Dist. Of Full Line Of Industrial Sewing & Trimming Supplies In Any Colors & Styles

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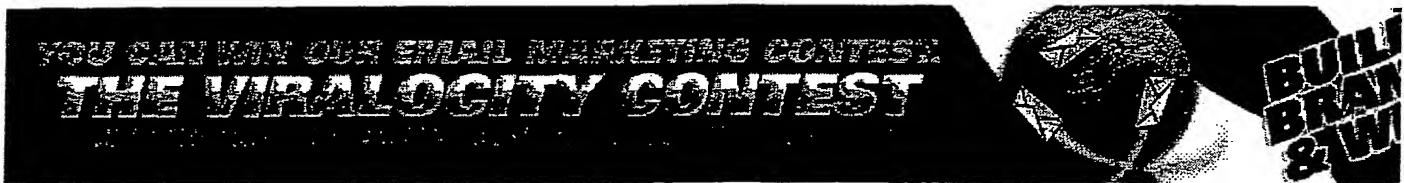
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<a href="#">Manderscheid Equipment &amp; Supply</a>	Chicago, IL	3M Hook & Loop Available	Select companies in state/province:
<a href="#">Jontay</a>	Waycross, GA	Dist. Of Webbing, Hardware, Buckles, & Notions. Plastic & Metal Buckles, Hook & Loop Elastic.	
<a href="#">Pam Narrow Fabrics Corp.</a>	Freeport, NY		
<a href="#">Suncor Stainless, Inc.</a>	Pembroke, MA		<input type="checkbox"/> Alabama <input type="checkbox"/> Alaska <input type="checkbox"/> Alberta
<a href="#">Andfel Corp.</a>	Bloomington, IN	Hand Held Attaching Tool Systems To Replace Thread, Metals Staples & Pins For Fabric, Drapery & Upholstery Applications....	
<a href="#">Mil-Spec Fasteners Corp.</a>	Hampstead, MD	Over 200 Million Fasteners In Stock, All Sizes / Materials, Hard-To-Find Items Military Specifications, MS-NAS-NASM,...	
<a href="#">Ronstan International Inc.</a>	Largo, FL	Mfr. Stainless Steel Narrow, Ferrule Eye & Flared Top Eye Straps. Also, Pulleys Sheaves, Rope Cleats, Stainless Steel...	To select multiple states, press (Cmd on Macs) 
<a href="#">Norse, Inc.</a>	Torrington, CT	Latches-Spring Loaded: Surface Mounted Externally / Internally-Mortised, Sealable, Ganged & Remotely Operated	
<a href="#">Triforce Fasteners</a>	Upland, CA	Complete Line Of Fasteners: Nuts, Bolts, Screws, Rivets, Retainers For Various Applications Covering Mil-Spec, Aerospace,...	
<a href="#">Missouri Threaded Rod, Inc.</a>	St. Louis, MO	Mfr. Of Threaded Rods Studs, Bolts, Nuts, Washers, Screws In Alloys & Stainless Steel	Search Again Find products and services in North American companies industries. <input type="text"/>
<a href="#">Stewart Handling Systems</a>	Chino, CA		
<a href="#">Quintana Industrial Supply, Inc.</a>	Lawrence, MA		
<a href="#">U.S. Slide Fastener Corp.</a>	Boston, MA		<input type="text"/>
<a href="#">Peters-De Laet, Inc.</a>	South San Francisco, CA		
<a href="#">ATCO</a>	Houston, TX		
<a href="#">Scovill Fasteners, Inc. (DOT, PCI)</a>	Clarkesville, GA	Fasteners	<input type="text"/>
<a href="#">Kornar / Stitchcraft</a>	Elk Grove Village, IL		
<a href="#">Argent Automotive Systems</a>	Novi, MI		
<a href="#">Bisco Int'l. Inc.</a>	Hillside, IL	Fasteners For Temporary & Permanent Jobs	<input type="text"/>
<a href="#">Aplix, Inc.</a>	Charlotte, NC		
<a href="#">Emar Separator Co., Inc.</a>	Long Island City, NY	Mfrs. Of Metal, Plastic, Nylon Zippers. Separators, Slide Fasteners Of All Sizes & Types	
<a href="#">Lockfast, Inc.</a>	Cincinnati, OH		<input type="text"/>
<a href="#">Lockfast-West</a>	North Las Vegas, NV		
<a href="#">CustomFab Inc.</a>	Huntington Beach, CA		
<a href="#">Royalox International, Inc.</a>	Phillipsburg, NJ		<input type="text"/>

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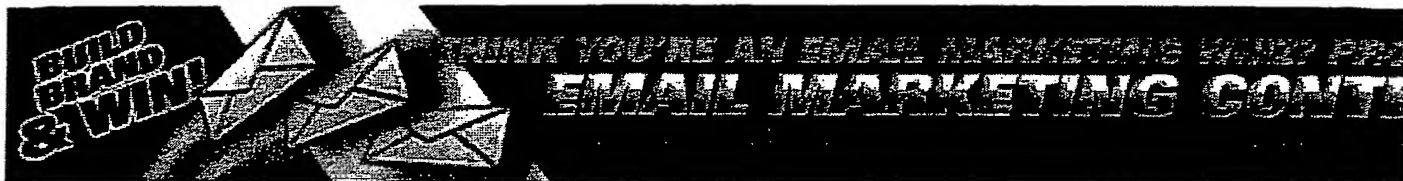
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<a href="#">Creative Packaging, Inc.</a>	Tulsa, OK		
<a href="#">Fare's Industrial Tools &amp; Supply</a>	Corona, CA		To select multiple states, press (Cmd on Macs)
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<a href="#">Mountainview Specialties Inc.</a>	Perkasie, PA		Search Again
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<a href="#">S.T. Robb Co.</a>	Edina, MN	Dist. Of Nuts, Bolts, & Screws. All Sizes	
<a href="#">Ozland Enterprises, Inc.</a>	Vicksburg, MI	Hook & Loop Straps & Fastening Systems: Variety Of Applications	Product/Service
<a href="#">YKK (U.S.A.) Inc.</a>	Lyndhurst, NJ		
<a href="#">Popco Inc.</a>	Minnetonka, MN	Brand Adhesive Backed Hook & Loop	
<a href="#">Mikron America, Inc.</a>	Paterson, NJ	Grommets, Caps, All Button Fastening & Covering Applications	
<a href="#">Ooltewah Mfg., Inc.</a>	Ooltewah, TN	Heat Sealing, Ultrasonic Sealing. Hook & Loop Cutting, Mating, Sewing & Bonding. Strapping, Hook & Loop, Patented...	
<a href="#">Cansew, Inc.</a>	Montreal, QC		
<a href="#">Valley Enterprises, Inc.</a>	Udly, MI		
<a href="#">Technifast Industries, Inc.</a>	Carol Stream, IL	Custom Cold-Headed Products, Specialty Fasteners, Screws, Special Items	
<a href="#">Iver Display</a>	Bangor, PA		
<a href="#">Progressive Plating Technology, Inc.</a>	Bridgeport, CT	ISO 9002 Certified. Automated Barrel Electroplating Certifying To Specs	
<a href="#">Vers-A-Flect</a>	Wilmot, NH	2", 1-1/2", 1", 5/8", Black & Navy Blue	
<a href="#">Automatic Plating</a>	Bridgeport, CT		
<a href="#">King, John, Inc.</a>	City of Commerce, CA		
<a href="#">Fastening Products Of Lancaster</a>	Lancaster, PA	Mfr. Distributor Of A Variety Of Fasteners. Standard, Metric, Military, Aerospace. All Alloys. Large Inventory. On Premise...	
<a href="#">AccuMED Technologies, Inc.</a>	Buffalo, NY		

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<a href="#">Great Industries Corp.</a>	Ontario, CA	Mfr. Of Hook & Loop Tapes & Neoprene Sheet
<a href="#">Excel Thread &amp; Sewing Supply</a>	Passaic, NJ	Mfr. & Distributor Of Industrial Sewing Threads
<a href="#">Ideal Fastener Corp.</a>	Oxford, NC	
<a href="#">Valley Products Co.</a>	York New Salem, PA	Sew-In Labels, Narrow Fabrics, Cotton Or Synthetic Tapes
<a href="#">Atron Products &amp; Services</a>	Alpha, NJ	
<a href="#">Design / Craft Fabric Corp.</a>	Niles, IL	
<a href="#">Hart Industries, Inc.</a>	Owings Mills, MD	
<a href="#">Scovill Fasteners, Inc.</a>	Clarkesville, GA	
<a href="#">Grimes Industrial Products Group</a>	Toronto, ON	
<a href="#">Baron Industries, Inc.</a>	Pine Brook, NJ	
<a href="#">Consumer Care Products, Inc.</a>	Plymouth, WI	Plastic & Fabric Tape
<a href="#">JRM Industries, Inc.</a>	Passaic, NJ	
<a href="#">Kronke Co., Inc.</a>	Hayward, CA	
<a href="#">Natvar Co., A Tekni-Plex Co.</a>	Clayton, NC	Electrical Sleeving & Insulation, General Purpose & Specialized Plastic Tubing
<a href="#">Saunders Corp. Div., R.S. Hughes Inc.</a>	Glendale, CA	
<a href="#">Ward &amp; Kennedy Co.</a>	Milwaukee, WI	
<a href="#">Merlin Industries</a>	New York, NY	Hook / Loop Fasteners, Buttons, Zippers, Shoulder Pads For Apparel

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<a href="#">Velcro USA Inc.</a>	Manchester, NH	Hook & Loop Fastening Systems For Industrial Applications Where Separation & Rejoining Of Components Is Necessary, Or Where...
<a href="#">Perfectex Plus LLC</a>	Huntington Beach, CA	Hook & Loop Fasteners. Sew-On Pressure-Sensitive Tapes. Heat & Solvent Activated Tapes. Fire-Retardant. Mil. Spec. Custom...
<a href="#">National Webbing Products Co.</a>	Garden City Park, NY	Complete Line Of Thermoplastic & Metal Components For Handbags, Sportbags, Luggage, Straps, Apparel, Footwear, Belts, Auto,...
<a href="#">American Cord &amp; Webbing Co., Inc.</a>	Woonsocket, RI	Assorted Sizes & Materials
<a href="#">Levitt Industrial Textile Co.</a>	Hicksville, NY	Dist. Of Velcro® Brand Hook & Loop Tape, Coins & VELCLOTH™ Brand Display Fabric. Special Colors, Widths, Lengths, Cut...
<a href="#">Speedtech International, Inc.</a>	Chicago, IL	Mfr. & Dist. Of Hook & Loop Fasteners. Stocking VELCRO®, SPEEDWRAP® & Other Brands
<a href="#">WBC Industries, Inc.</a>	Westfield, NJ	Hook & Loop Fasteners
<a href="#">Tapelex Tape Machine Corp.</a>	Ashland, MA	Automatic Or Semi-Automatic High-Speed Tape Applicators For All Types Of Pressure Sensitive Tape With Or Without Liner,...
<a href="#">Bond Products Inc.</a>	Philadelphia, PA	Suppliers Of Narrow Fabrics, Including Woven Tapes, Hook & Loop Tape & Dots, Drawcord Braids, Webbing, Elastics, Tying...
<a href="#">Middleburg Thread &amp; Sewing Supply</a>	Warminster, PA	Sew-On, Pressure Sensitive, Heat Activated, Solvent Activated, Polyester, Cut Pieces, Fabricated Straps & Assemblies
<a href="#">Toleeto Fasteners International</a>	San Ysidro, CA	Reusable Hook & Loop Cable Ties, Wrist Bands & Custom Fabricated Straps For A Variety Of Applications. Ultrasonic Welding &...
<a href="#">Bardsco</a>	St. Louis, MO	Reusable Hook & Loop Cable Ties, Wrist Bands & Custom Fabricated Straps For A Wide Variety Of Applications. Ultrasonic...
<a href="#">Touchtape, Inc.</a>	St. Augustine, FL	Standard & PS Hook & Loop Tape & PS Dots Available. In-House Mfg. & Fabrication. Custom Orders
<a href="#">Lea &amp; Sachs, Inc.</a>	Des Plaines, IL	
<a href="#">FASTENation, Inc.</a>	Passaic, NJ	Dist. & Fabricator Of Hook & Loop Fasteners, 3M Dual Lock
<a href="#">Precision Plastics</a>	Beltsville, MD	Custom Mfr. Hook & Loop Fasteners, Made To Specs., In-House Design Assistance
<a href="#">Alliance</a>	Hot Springs, AR	Designer & Mfr. Of All Varieties Of Rubber Bands For All Applications Including Office, Home, Industry & Produce. Packaging,...
<a href="#">Brunner Manufacturing, Inc.</a>	Mauston, WI	Special Cold Headed & Formed Products For All OEM & After Market Needs. Special Bolts, Drilled

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<u>Blair Co.</u>	Elk Grove Village, IL	
<u>Cable Markers Co., Inc.</u>	Lake Forest, CA	Identification Products, Wire Markers, Computer Printable Systems, Labels, Tags, Heat Shrink Sleeving, Serialization, Bar...
<u>Advanced Cable Ties, Inc.</u>	Gardner, MA	Mfg. & Specializing In Nylon, Stainless Steel, & Hook & Loop Cable Ties, Cable Tie Accessories, Cable Clamps, Cable Wraps,...
<u>Allan Zipper Mfg. Corp.</u>	Brooklyn, NY	Custom & Stock 4-Gauge Vinyl Bags With Zipper, Snaps; For Drapes, Garments, Curtains, Comforters, Textiles
<u>Adhesives &amp; Tapes Industrial Supply</u>	Vista, CA	Adhesives, Sealants, Coatings, Encapsulants, Tapes & Application Equipment. Casting Resin, Acrylic, Anaerobic,...
<u>Avery Dennison, Fastener Div.</u>	Framingham, MA	Cable Tie Products For Wire Harnessing, Packaging, Secure Holding & Bundling Functions

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<a href="#">Ribbon Webbing Corp.</a>	Chicago, IL	Mfrs. Of Polypropylene, Nylon & Polyester Webbing, Also Hook & Loop, Gros Grain. Webbing For All Purposes, In All Colors &...
<a href="#">MULTI TRIM</a>	New York, NY	Mfrs. & Dist. Of Full Line Of Industrial Sewing & Trimming Supplies In Any Colors & Styles, Hook & Loop Fasteners, Zippers,...
<a href="#">Converters Inc.</a>	Huntingdon Valley, PA	
<a href="#">Hope Global</a>	Cumberland, RI	Loop Attachment Strip For Automotive & Industrial Seat Builds
<a href="#">Quintana Industrial Supply, Inc.</a>	Lawrence, MA	
<a href="#">U.S. Slide Fastener Corp.</a>	Boston, MA	
<a href="#">Peters-De Laet, Inc.</a>	South San Francisco, CA	
<a href="#">ATCO</a>	Houston, TX	
<a href="#">Industrial Tape &amp; Supply Co.</a>	Marietta, GA	
<a href="#">Bead Industries, Inc.</a>	Bridgeport, CT	
<a href="#">Rip 'N Grip Industries, Inc.</a>	Palmdale, CA	

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[3M™ Scotchmate™ Reclosable Fastener Plastizier Resistant Loop SJ3523](#)

[3M™ Scotchmate™ Reclosable Fastener SJ3418FR](#)



APPENDIX  
EXHIBIT D

Page D1-D4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

TENNIS RACQUET EQUIPPED  
WITH A TENNIS BALL RETRIEVER

Alice H. Howe

Filed: 09/06/00

) Art Unit: 3711  
)  
) Serial No.: 09/655,743  
)  
) Docket No.: MPH 99-46  
)

AFFIDAVIT UNDER 37CFR1.132

STATE OF WISCONSIN )  
)  
COUNTY OF LA CROSSE )

I, ALICE HOWE, being duly sworn, deposes and states as follows that:

1. I was granted an R.N. degree by St. Frances School of Nursing. I was employed as a Registered Nurse at the La Crosse Clinic from 1958 to 1969; at the University of La Crosse Health Center from 1970 to 1980; and at St. Frances Hospital from 1980 to 1995. I have been an avid tennis player and fan for more than half a century, having played tennis on tennis courts throughout the U.S.A., Mexico and Europe.

2. I devised the testing procedures used to test the efficacy of hook and loop type fasteners as reported in the Example of the captioned patent application.

3. I am also the applicant of the invention described and claimed in the above application.

4. I have read and am familiar with the Office Action of Paper No. 3, the claims as currently to be amended in the response to Paper No. 3 by my attorney, the cited references of Paper No. 3, and the rejection of claims 1-7, 9, 10 and 12 as unpatentable over 35USC103(a) over U.S. Pat. No. 4,834,393 (*Feldt*) or French Patent No. 2594037 (*Musslin*), and either in view of U.S. Pat. No. 5,077,870 (*Melbye et al*) and alleged

applicant's admission of prior art in the specification; and the rejection of claims 8, 11 and 13-15 as unpatentable over *Feldi*, or *Musslin*, and in view of *Melbye* and applicant's admission of the prior art in his specification and in further view of U.S. Patent cited No. 4,993,712 (*Urwin*).

5. Pursuant to the request of my patent attorney, a mushroom-type strip fastener, representative of U.S. Patent No. 5,077,870 (*Melbye*), was tested under identical testing procedures as reported in the Example of the captioned patent application to determine its ability to engage and lift ordinary tennis balls from the ground. Representatives of the manufacture and patent assignee of the U.S. Patent No. 5,077,870 (*Melbye*) indicated that the loop mushroom-type strip fasteners (Dual-lock) used in this test was fairly representative of the mushroom-type fasteners of U.S. Patent No. 5,077,870. In the test, a one-foot length of the mushroom-type strip fastener was attached by its own adhesive backing to the outer edge of the shoulder of a Wilson tennis racquet. Pursuant to the test, three of the most commonly used tennis balls, namely Wilson Championship tennis ball, Dunlop Tournament tennis ball, and Penn Medalist tennis ball were tested. In each test, ten attempts were made to engage and lift each ball by firmly contacting the face of the "Dual-lock" fastener material to the felt or nap of the tennis ball.

6. In all thirty attempts of paragraph 5 above, to lift the three different types of tennis balls off the ground with the mushroom-type strip fastener of U.S. Patent No. 5,077,870 (*Melbye*), all attempts were completely unsuccessful upon all of the tested tennis balls. The "Dual-lock" mushroom-type fastener of U.S. Patent No. 5,077,870 (*Melbye*) failed to adhere, stick or attach onto any of the felt surfaces of any tennis ball in any of the aforementioned 30 test attempts.

7. It is therefore concluded that the tested mushroom-type strip fastener of U.S. Patent No. 5,077,870 (*Melbye*), when attached to the edge of an ordinary tennis racquet, is totally ineffective for retrieving ordinary tennis balls off the ground upon tangential contact as prescribed by my amended claims.

8. The physical and functional properties of the *Melbye* mushroom-type fastener do not permit it to engagingly attach or adhere to the felt surface of a common tennis ball as evidenced by the test results reported herein.

9. The mushroom-type fastener of U.S. Patent No. 5,077,870 to *Melbye* cannot engage and lift a grounded tennis ball upon tangential contact as defined by the amended claims of the captioned application.

10. It is factually incorrect to conclude that *Melbye* U.S. Patent No. 5,077,870 at column 1, lines 15-23 discloses Velcro™ and ScotchMate™ are functional equivalents as hook-and-loop fasteners or that equivalency may be extended to cover the uniquely different pre-shrunk nylon monofilament hooks of the highly specific and narrowly defined characteristics as defined by the currently amended claims.

11. The mushroom-type fastener of U.S. Patent No. 5,077,870 to *Melbye* fails to meet the claimed requirements of a series of pre-shrunk nylon monofilament hooks of:

- a) an average height of at least 1.85 mm
- b) an average diameter of at least 8.25 mil
- c) an average hook width of at least 1.0 mm; and
- d) an average hook depth of at least 0.6 mm

12. United States Patent No. 5,077,870 to the *Melbye* patent discloses and claims "a mushroom-type hook strip" having an "array of upstanding stems" and "a mushroom head at an end of the stem" as shown in Figure 1 of the *Melbye* patent which is clearly different in physical and functional characteristics from the claimed preshrunk monofilament hooks as illustrated in Figure 5 of the captioned application.

13. The mushroom headed stem of U.S. Patent No. 5,077,870 to *Melbye* patent is completely different in physical structure and function from the claimed hooked configuration and characteristics of the claimed preshrunk monofilament hooks.

14. The *Melbye* mushroom hook fasteners are neither the actual nor functional equivalent of the monofilament hooks as characterized and defined by the currently

pending claims in the captioned application as verified with the testing results reported herein.

15. For comparison purposes to the mushroom-type fastener of U.S. Patent No. 5,077,870, a monofilament as defined in claims 4-15 of the captioned application, when tested pursuant to Example 1, provided the unexpectedly superior efficacy upon tangential contact onto all three types of grounded tennis balls, as has been reported in the Example of the captioned patent applicant.

16. The above comparative test results represent a fair comparison between the claimed preshrunk monofilaments of the captioned application and the mushroom-type fasteners of U.S. Patent No. 5,077,870.

17. Further deponeth sayeth naught.

Alice H. Howe  
Alice H. Howe  
Affiant

10/18/01  
Date

STATE OF WISCONSIN )  
COUNTY OF LA CROSSE ) ss.

Personally came before me this 18<sup>th</sup> day of October, 2001,  
the above-named Alice H. Howe to me  
known to be the person who signed as Affiant who executed  
the foregoing instrument and acknowledged the same.

[Signature]  
Notary Public

State of Wisconsin

My commission expires May 8, 2005

**Per Alice Howe 4/9/2002**

**She spoke with Wilson Ball Co., Chicago, Illinois, who advised her as follows:**

**Tennis Ball Standard of Identity:**

- 1. Round**
- 2. Diameter of no more than 6.5 cm and no less than 6.3 cm**
- 3. Made of rubber core with two halves glued together to make the sphere.**
- 4. Injected with air pressure (12 psi)**
- 5. Must be covered with felt; yellow or green**

**(they also number the balls [1, 2, 3 or 4] for players' use and identity; and they stamp the Wilson brand name on the ball)**

## THE MAKING OF A TENNIS BALL

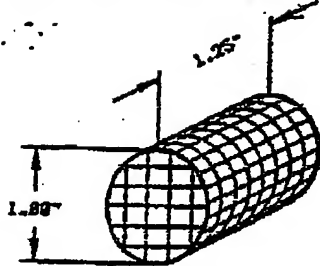
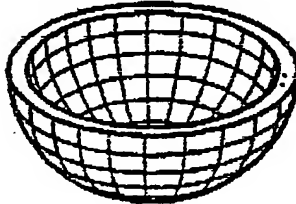
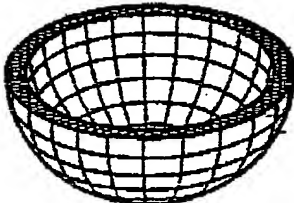
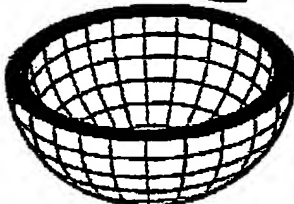
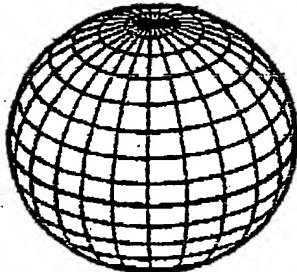
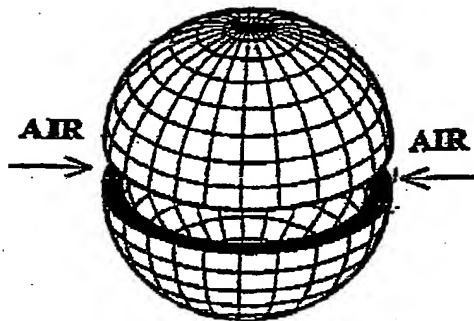
- Have you ever wondered how a tennis ball is made?
  - Or, why there are so many different types of tennis balls?
  - Have you ever wondered how a tennis ball got it's fuzzy, yellow cover?
- All of these questions, and more, will be answered if you continue to read on.

### FIRST A LITTLE HISTORY :

For many years, little effort was made to standardize the construction, and performance of tennis balls. But now, the International Tennis Federation (ITF) not only specifies the size, weight, and construction of the ball, but they also specify the hardness, and resiliency (or bounce characteristics) of the ball. The current ITF specifications are as follows:

	Size (inches)	Weight (grams)	Construction	Hardness (inches)	Resiliency (inches)
Maximum	2.700	58.5	Fabric cover with stitchless seams	.290	58.0
Minimum	2.575	56.7		.220	53.0

Historians believe that tennis originated from the Greek, and Roman Handball Game. The ball for this game consisted of a tightly compressed cloth, covered with a lighter layer of cloth, similar to today's tennis ball. Next, came balls with wool cores, and a hand stitched leather cover. These balls were more like soft baseballs. Occasionally, these balls were manufactured with a feather core. These balls did not possess much bounce, and were significantly heavier than today's ball. In 1873, the game "Sphairistike", or Lawn Tennis was invented, and played with a lightweight, uncovered rubber ball. In England, Mr. John Heathcote, who was a real champion of tennis as we know it, found the uncovered ball too light, especially during windy play conditions. In response to this, he and his wife developed the familiar pattern of two dogbone-shaped felt panels, which would completely envelope the rubber core. For these early samples, the felt cover panels were hand stitched onto the rubber core, similar to a baseball. In the late 1920's, special adhesives were developed for attaching the felt cover to the core, thereby eliminating the stitched cover. This ball is what we now think of as a tennis ball.

**RUBBER SLUG****HALF SHELL****HALF SHELL WITH  
BUFFED SEAM****HALF SHELL WITH  
SEAM ADHESIVE****BONDED CORE****HOW A TENNIS BALL IS MADE :**

**STEP #1 – Making the Pressurized Core :** When Wilson Sporting Goods manufactures a tennis ball, they begin with the finest rubber, and premium quality ingredients available. These ingredients are first mixed with precision in a large rubber mixer, to produce a superior rubber compound. Next this compound is extruded, and cut into cylindrical - shaped slugs, measuring about 1" in diameter, and 1.25" long.

Each slug is then placed into a press, where it is molded, under heat, and pressure, to form a half shell, which will become one half of a finished core.

When the half shells are removed from the press, each hemisphere has a thin web of rubber around the entire perimeter of the half shell, which is called flash. This flash is removed in a precision stamping press, which trims away the unwanted flash. The seams of these trimmed half shells are then buffed, using a sandpaper buffing disc, and then coated with a special, high - strength seam adhesive.

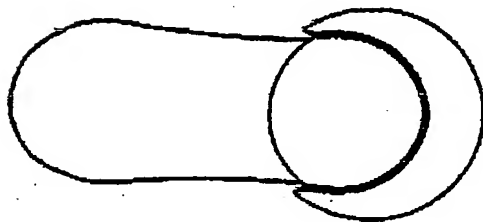
An equal number of these half shells are then carefully placed into a special press, so that each pair of half shells have their buffed, and cemented seams, facing each other. Just before the press closes, a precise amount of air pressure ( approx. 15 psi ) is introduced into the small chamber between the mated half shells. Once the pressure stabilizes within the chamber, the press closes completely, thereby, trapping the air pressure within the core. This air pressure provides the tennis ball it's lively bounce characteristics. Under heat and pressure the two half shells are bonded, or vulcanized, together. We now have a pressurized tennis ball core.

These cores are then tumbled in a large, sandpaper-lined drum to roughen the surface of the core, in preparation for the application of core coating adhesive. These abraded cores are then dipped into a special core coating adhesive, and dried to the proper consistency, so that the adhesive becomes tacky, and ready to receive a felt cover. This adhesive will provide a strong bond between the core, and cover.

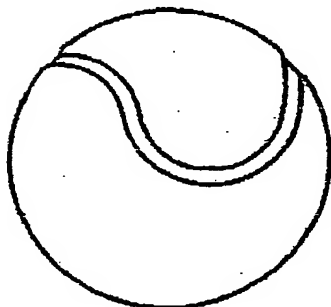
**FELT DOGBONE**

**STEP #2 – Preparing the Felt Dogbones:** The other piece of the puzzle is the felt. Felt is a fabric composed of primarily high grade wool, and nylon. It arrives at the Wilson Factory in large rolls, at which time it is checked for thickness, weight, color, and wear properties before processing into dogbones.

The first step in preparing the felt is to apply adhesive to the backside of the felt. This is accomplished in a large machine which coats the entire roll of felt, in a continuous process. This machine also dries the felt sufficiently so that the felt may be re-rolled at the end of the machine. This adhesive will make sure the felt does not separate from the core during play.

**BALL COVERING**

Next, these adhesive coated rolls of felt are fed into a machine which cuts the felt into the familiar dogbone shaped panels. The dogbones are then stacked into clamping fixtures, and squeezed in compression, for the next operation. Two dogbones are required for each finished ball.

**FINISHED BALL**

The packs of felt dogbones, held in the clamping fixture, are then dipped into a tank containing a very special adhesive, which coats only the edges of the felt dogbones. This adhesive will eventually become the familiar white, curvy seam of the tennis ball. After drying to the proper degree, the felt dogbones are then "picked" from the dipped packs, and placed into a ball covering machine, where they meet one of the adhesive coated rubber cores, from Step #1. The ball covering machine precisely places the two felt dogbones onto the rubber core.

**LOGOED BALL**

This is not yet a finished tennis ball. The covered balls are then placed into a final molding press, where heat, and pressure bond the covers to the core, and also form the familiar white seam of the ball. When the balls leave this final molding process, the felt on the balls is in an extremely compressed state, from the heat and pressure of the press. The felt is fluffed back to it's original form in a large industrial dryer. Initially, steam is introduced into the fluffer to loosen up the felt fibers, and allow the fibers to spring back to their original position. Finally, the fluffer dries the balls using hot, circulating air, similar to a clothes dryer at home.





We now have a finished tennis ball. These balls are next inspected for conformance to Wilson's rigid quality standards, and if found acceptable, will be stamped with the familiar "Wilson" logo. Just before the application of the logo, each ball must pass a compression test, which assures that the ball has the proper air pressure.

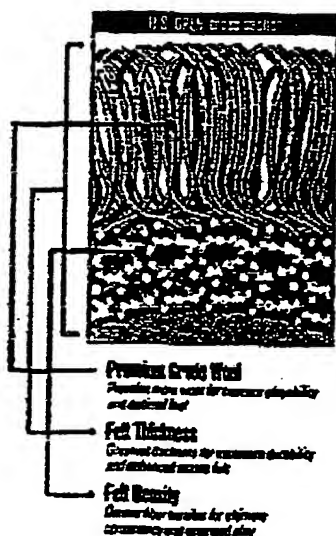
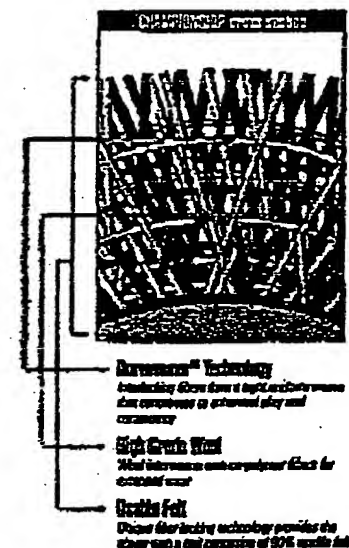
The finished balls are then placed into recyclable plastic cans, pressurized to the proper can pressure, and sealed with an aluminum, EZ Open lid. Each can is tested to insure that it is properly pressurized, and sealed. Lastly, a plastic overcap, and label are placed on the cans, and the cans are placed into cardboard boxes, ready for shipment to our customers.

### TYPES OF TENNIS BALLS :

You may still be wondering why there are so many different types of tennis balls. There are two major categories of tennis balls — Pressurized, and Pressureless. The majority of tennis balls sold today are Pressurized Products. These products are packaged in a specially designed pressurized container, which keeps the balls fresh for years, until the can is opened, and the seal is broken. Pressurized tennis balls are more lively than Pressure-less balls, and feel lighter off the racket.

Pressureless tennis balls are manufactured with a thicker rubber wall, and with no internal ball pressure, which makes them play slower, and feel heavier off the racket. On the positive side, because there is no internal air pressure to lose, Pressureless tennis balls maintain their bounce characteristics better than pressurized balls, over the life of the ball.

Two other tennis ball products are the High Altitude Ball, and the Grass Court Ball. These two products are specially designed for specific playing conditions. The High Altitude Ball is made with a slightly lower air pressure than the Standard Wilson Ball, to compensate for the slightly lower barometric pressures found at altitudes above 3,500 feet. This change insures that the High Altitude Balls bounce correctly at higher altitudes. The Grass Court Ball features specially treated white felt that is ideal for grass court play.





Tennis balls are also categorized by the type of felt used to produce the balls. The first type of felt, called woven, is typically made from a combination of wool, and nylon fibers, woven together in a large textile loom. The woven fabric is subjected to a large number of secondary operations, which remove the woven pattern, and provide the familiar "felt" look of a tennis ball. This type of felt is used on the Wilson U.S. Open Products.

Duraweave Felt was developed by Wilson, using a high grade wool that is uniquely interlocked with copolymer fibers to form a tight uniform weave. This construction provides a long lasting felt, which enhances the playing characteristics, and consistency of the ball. This type of felt is used on the Wilson Championship Products.

Each of the felts described above support two different levels of play - Extra Duty and Regular Duty. Extra Duty Felt is designed for play on abrasive surfaces where the fibers must withstand the shearing, and cutting action of abrasive courts. This felt does not normally fluff excessively, although high humidity, or hitting the ball with a great deal of spin may cause Extra Duty Felt to fluff more than normal.

Regular Duty Felt is designed for soft, smoother court surfaces, and indoor courts. The increased moisture of clay, or grass courts, and the high level of static electricity found in indoor courts will cause the felt to fluff more than normal. In addition, smooth court surfaces will pull, and tug at a felt (rather than the shearing, and cutting action associated with abrasive courts), causing more fluff on the felt. Therefore, it is crucial that Regular Duty Felt be designed to be highly resistant to fluffing.

So that is the story of why there are so many different types of tennis balls, and how they get their fuzzy covers. The yellow colored felt was introduced in the early '70's to improve the visibility for the players and the TV audience. From the finest raw materials, highest quality felts, and meticulous control of manufacturing processes, comes the "Wilson U.S. Open Ball.... the Tennis Ball as Tough as the Tournament".

## **TENNIS BALLS FUN FACTS**

Wilson is rated as the best playing ball in tennis by over four hundred top tennis players.

### **THE BEST PLAYERS PICK WILSON AS THE BEST BALL!**

Wilson is the ball purchased most often by the best tennis players.

Wilson is the only ball used at all USTA National Championships.

Wilson is the only ball used by the WTA-The Women's Tennis Association

Wilson is the official ball of the US Open since 1979.

Wilson tennis balls are sold throughout the world including France, Germany, England, Japan, Singapore, Hong Kong and Latin American countries.

With the consistent quality, innovation and performance Wilson delivers, it has become the standard of play for an industry.

### **Wilson, the Number One ball**

## **PUTTING IT ALL TOGETHER**

### **Wilson Tennis Ball Manufacturing Fact Sheet**

The first step in making a tennis ball is to prepare and mix together the ingredients that make the ball's core. The core of a tennis ball includes approximately 14 different materials. #1 is natural rubber. The tennis core stock undergoes extensive quality control testing throughout the blending process to ensure consistency.

This rubber is then made into thick sheets, milled, and then a machine punches out "slugs" which are cylindrical shaped chunks of rubber that are all the same size and shape. This "slug" is then molded into a perfectly shaped hemisphere under controlled curing conditions of time, temperature and pressure (referred to as first cure). These curing conditions are continuously monitored in order for the half shell to meet our specific requirements.

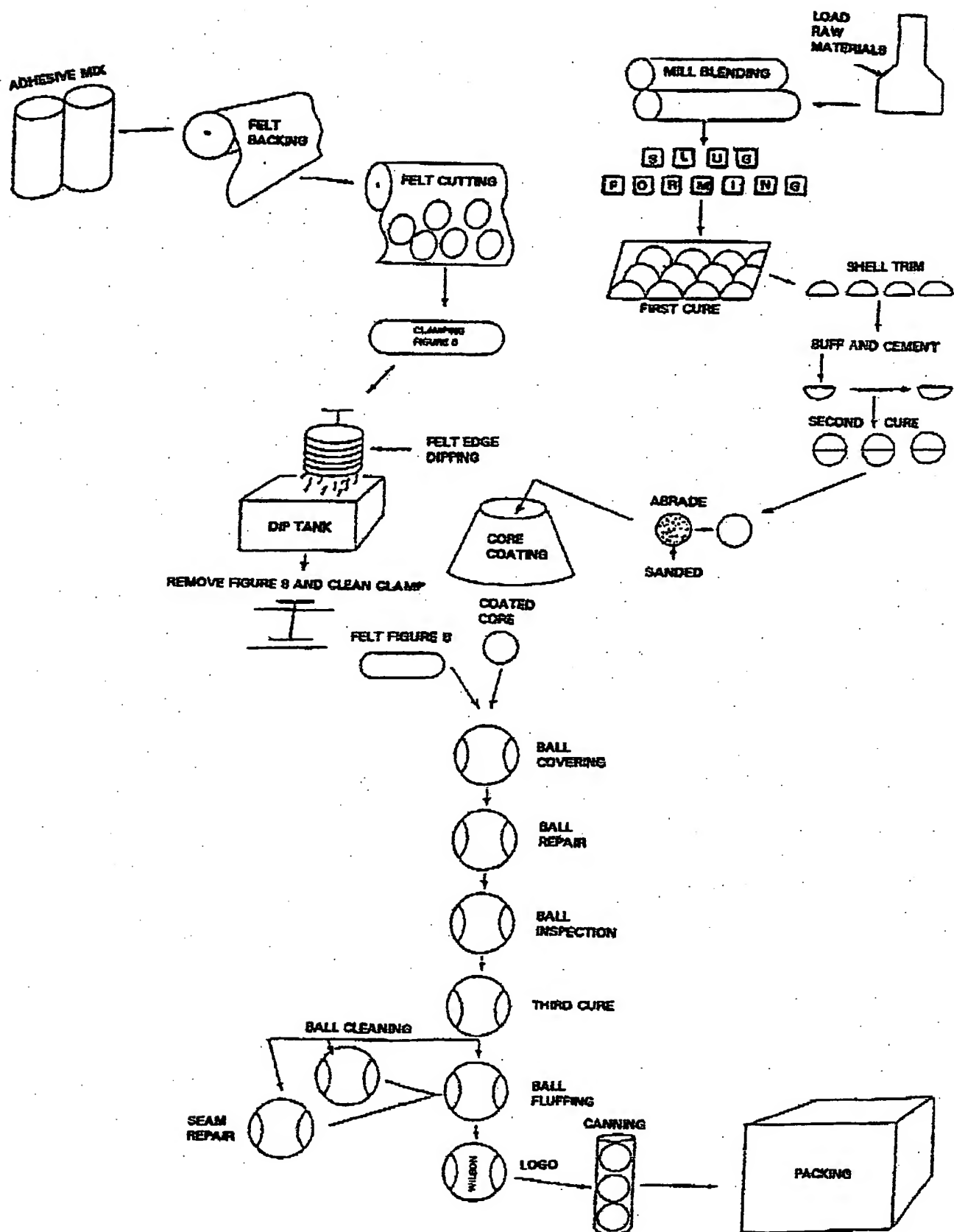
Each half shell is then buffed to even true the edges and prepare them for the adhesive that is used to bond the two halves together. The half shells are loaded into the top and bottom of a machine that looks like a waffle iron or an egg carton and they are cured here under controlled time, temperature and pressure. The inner chamber is pressurized so that the air trapped inside as the halves are fused together is at the same pressure (referred to as second cure). The adhesive on the half shell edges fuses the two half shells together for a tight seal. The pressure of each of our second cure presses are constantly monitored to ensure consistency of the core.

QC will then sample cores to test them for weight, size, rebound and deflection. The surface of the cores will then be abraded (roughened) in preparation for adhesion of the felt strips. The core is then dipped in a high quality adhesive compound and oven dried in preparation for the cover application.

A mix of specifically designed fibers are processed together to form rolls of felt material. These rolls are then "back coated" with a specially designed adhesive. Several rolls of back coated felt are fed into an automated high-speed cutting machine which punches out the figure 8 shaped pieces of felt and packs them together into a bundle. The felt packs are then dipped into a vat of white seam adhesive which coats only the edges of the felt. The felt packs are dried and the figure eights are then separated. The back coated figure eights are now inserted into the felt covering machine and placed on the core. At this point, the product starts to resemble a tennis ball. The final cure insures a perfect bond between the ball and cover. Under conditions of time, temperature and pressure, the felt is bonded to the core and the seam adhesive is cured (referred to as third cure). Extensive quality control checks are conducted throughout this entire process to assure a high quality finished product.

After third cure, the balls are steam fluffed to raise the nap on the felt, giving the balls their fuzzy appearance. After the fluffing process, the balls are visually inspected for cosmetic quality. Next comes the stamping of the company logo and number. The logo operation is also systematically controlled in order to maintain the proper positioning. QC will then sample finished balls and test them to assure that they meet USTA and player specifications. Three balls are sealed in air tight pressurized cans. The pressurized can keeps the ball pressurized for excellent bounce and playability.

## FLOW CHART



# USTA TENNIS BALL SPECIFICATIONS

## APPENDIX

### RULE 3

#### BALL - SIZE, WEIGHT AND BOUND

<sup>1</sup> The ball shall have a uniform outer surface and shall be white or yellow in color. If there are any seams they shall be stitchless. The ball shall be more than two and a half inches (6.35 cm) and less than two and five-eighths inches (6.67 cm) in diameter, and more than two ounces (56.7 grams) and less than two and one-sixteenth ounces (58.5 grams) in weight. The ball shall have a bound of more than 53 inches (135 cm) and less than 58 inches (147 cm) when dropped 100 inches (254 cm) upon a concrete base. The ball shall have a forward deformation of more than .220 of an inch (.56 cm) and less than .290 of an inch (.74 cm) and a return deformation of more than .350 of an inch (.89 cm) and less than .425 of an inch (1.08 cm) at 18 lb. (8.165 kg) load. The two deformation figures shall be the averages of three individual readings along three axes of the ball and two individual readings shall differ by more than .030 of an inch (.08 cm) in each case. All tests for bound, size and deformation shall be made in accordance with the regulations in the Appendix hereto.

<sup>1</sup> The Official USTA Yearbook and Tennis Guide With The Official Rules, H.O. Zimmerman, Inc., 156 Board St., Lynn, MA, 01901, 1977, pp. 415.

## TENNIS BALLS

### DIFFERENCES BETWEEN PRESSURIZED & PRESSURLESS TENNIS BALLS

1. Pressurized balls have traditionally been the ball of choice in this country. This preference for pressurized is based on the following:
  - They are typically more lively than pressureless and feel lighter off the racquet.
  - Pressurized balls typically sound a little crisper when hit.
  - Pressurized balls (in this country) are very inexpensive. In 1930, a can of 3 Wilson tennis balls could be purchased for \$1.50 in a Sears & Roebuck catalogue. Over sixty (60) years later, that same can of balls may be purchased for under \$2.00. With this low price, a large majority of players open a new can of tennis balls at every outing.
2. Pressurized balls are packaged in specially designed pressurized containers which are capable of keeping the balls fresh for years in storage. However, once the seal of the can is broken and the pressure is released, the balls will begin to lose air and, therefore, liveliness. The rate at which this occurs is a function of the following:

**TEMPERATURE:** The higher the temperature, the faster the balls will lose air (liveliness). For example, at room temperature a ball would typically lose approximately 2 psi of air pressure in a 2-month time period. This would result in a 2 inch loss of rebound height (liveliness) which a good player could potentially notice.

At elevated temperatures, such as 100° F, this loss of air pressure would occur much faster - probably 2 weeks instead of 2 months. For this reason, it is not a good idea to store opened tennis balls in the trunk of your car during the hot summer months. We recommend storing the balls at a cool temperature, even a refrigerator, if you have the room.

**USAGE:** Although we don't have any hard data to substantiate this claim, we do believe balls lose air much faster when they are used in play. The impact with the racket and court during play heat up the balls, resulting in a higher internal pressure and, consequently, a higher permeation rate.

3. In sharp contrast to the above, pressureless tennis balls have no internal pressure inside the core. Therefore, they will not lose liveliness over time. This provides more consistent performance over time. The most frequent complaint about pressureless balls is that they are slow playing and feel heavy on the racket. The Wilson "advantage" tennis ball is specially formulated to eliminate this heavy feeling on the racquet. Additionally, its slightly slower playing characteristics make it ideal as a practice ball since it provides a little extra time to prepare for shots. Pressureless balls are ideal for ball baskets since they don't lose air pressure (liveliness) over time. In areas of the world where tennis balls cost 2-3 times more than in the US, pressureless balls enjoy a significant market share. They represent an excellent value to the cost conscious consumer.



## **EFFECTS OF TEMPERATURE ON THE REBOUND HEIGHT OF A TENNIS BALL**

### **ITEMS TESTED**

**6-Wilson T1001 Championship Extra Duty tennis balls**

### **TEST PROCEDURE**

- 1. Balls were kept overnight at room temperature and measured for 100" rebound height the next day.**
- 2. Balls were placed in a refrigerator overnight at a temperature of 38°F. The next morning, one ball at a time was removed from the refrigerator and measured for rebound height as quickly as possible.**
- 3. Balls were placed in an oven at 100°F for 6 hours. It is important to note that the balls were placed inside a small cardboard box to prevent the hot oven air blast from impinging directly on the balls. After 6 hours, one ball at a time was removed from the oven and measured for rebound height as quickly as possible.**
- 4. Step #3 was repeated at an oven temperature of 130°F.**

### **TEST RESULTS**

**The results on the 6 tennis balls tested were averaged and plotted as a function of temperature. The results may be found in Graph 1 attached.**

### **DISCUSSION OF RESULTS**

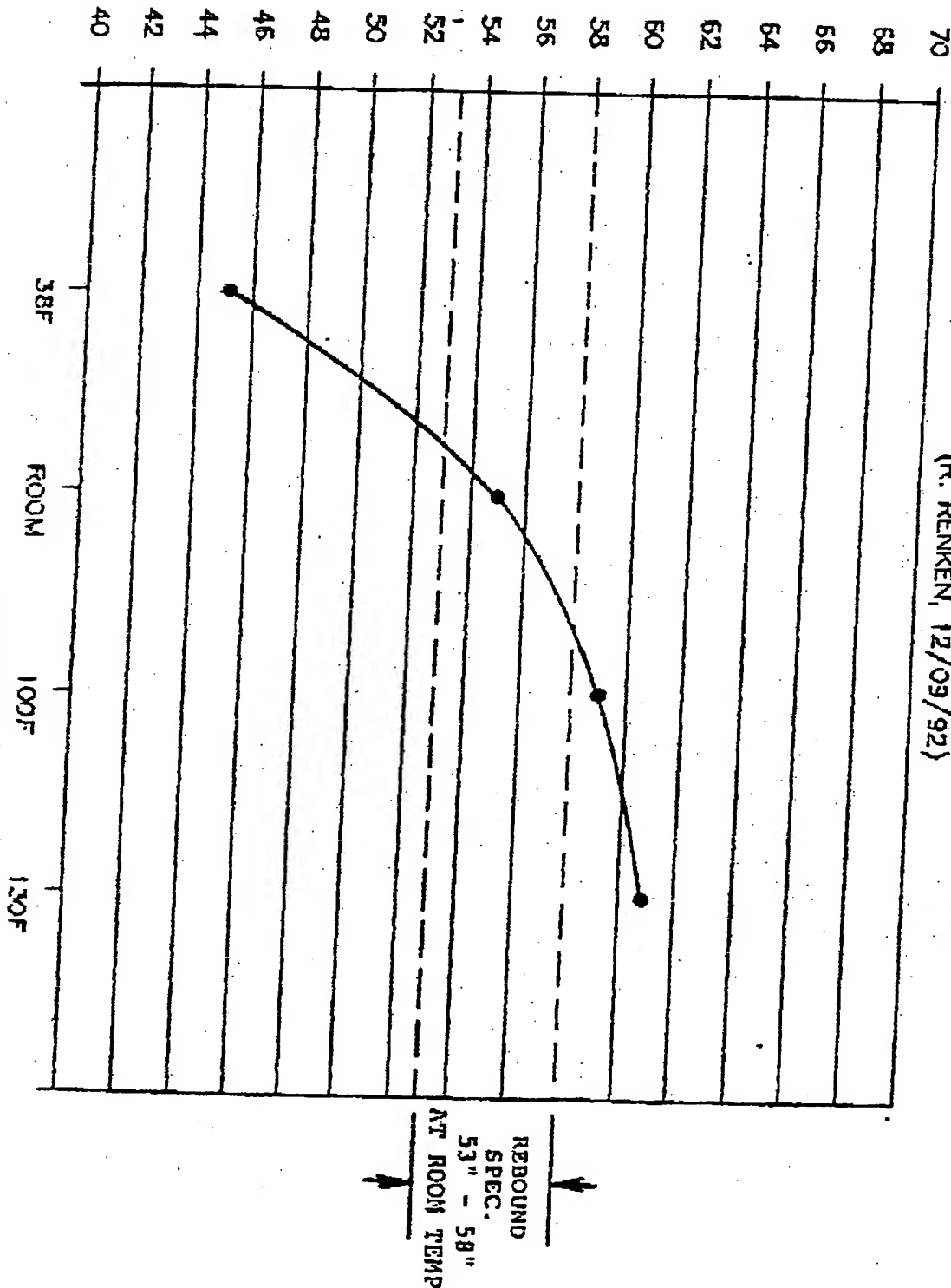
- 1. Temperature was found to have a strong influence on rebound height.**
- 2. Rebound height was most effected at the lower temperature of 38°F. On average, the balls lost 10 inches of rebound in going from 72°F to 38°F. It is important to note that if the balls at low temperatures were used in play, they would quickly increase in rebound height because of the warming of the balls due to flexing of the core.**
- 3. The balls quickly fell out of the rebound specifications of 53" - 58" when exposed to the 3 test temperatures.**

REBOUND FROM 100" DROP, Inches

**GRAPH 1**

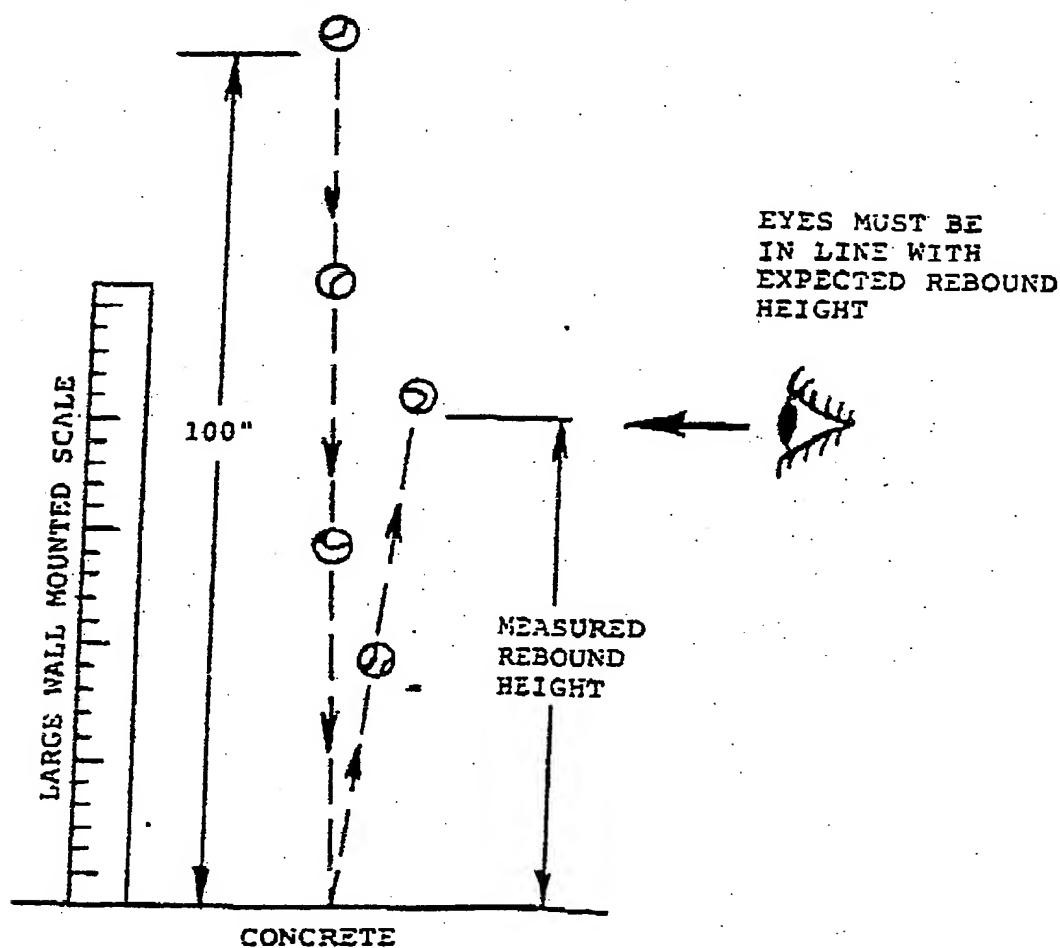
**REBOUND HT VS TEMPERATURE**

(R. RENKEN, 12/09/92)



## 100" REBOUND HEIGHT TEST

1. Balls were dropped from 100" (as measured from the bottom of the ball) onto a solid base, preferably concrete or granite.
2. Rebound height is measured to the bottom of the ball using a large graduated scale mounted behind the ball.
3. Care must be taken to assure that the eyes of the tester are in line with the approximate rebound height of the ball.
4. Three readings must be taken for each ball, and the average of the three is recorded as the rebound height.



## PERMEABILITY OF TENNIS BALL CORES

The can is pressurized (not vacuum) with approximately 12 LB/IN<sup>2</sup> pressure to maintain the pressure in the ball. Once the can is "popped", and pressure is released, the balls will lose air pressure at a slow rate, similar to a car tire losing air. Below is a test report showing the change in "Rebound Height" and "Deformation" as a function of time (or days out of the can). As you will notice, the balls lose rebound height (bounce) and become softer. The air pressure leaks through the microscopic pores in the wall of the rubber core.

### PERMEABILITY TEST OF TENNIS BALL CORES

#### ITEMS TESTED:

Twelve (12) Wilson Extra Duty tennis balls made with the following compounds:

>  
>  
>

*Confidential*

#### TEST PROCEDURE

Each group of balls were tested initially right out of the can for rebound and deformation. The balls were then placed in the lab conditioner at the standard test conditions of 68°F and 60% Relative Humidity. The balls were then re-tested every two (2) days for three (3) weeks. After 27 days, the balls were re-tested every seven (7) days. After 41 days the balls were re-tested every thirty (30) days. The balls were out of the can for a total of 196 days when the test was discontinued.

#### TEST RESULTS & CONCLUSIONS

The following table lists the rebound and deformation mean and standard deviation for the various compounds over a number of days out of the can:

This data has been plotted and curve fitted by computer using linear regression formula. The coefficient of determination ( $R^2$ ) and the individual predication equations are given in the following table:

REBOUND		DEFORMATION	
$R^2$	$\hat{Y} = A + Bx$	$R^2$	$\hat{Y} = A + Bx$
0.948	$Y = 55.81 \pm 0.034x$	0.984	$Y = 0.2731 + 0.00031x$
0.975	$Y = 55.31 \pm 0.032x$	0.979	$Y = 0.2371 + 0.00028x$
0.969	$Y = 55.06 \pm 0.036x$	0.984	$Y = 0.2320 + 0.00028x$
0.972	$Y = 56.36 \pm 0.038x$	0.974	$Y = 0.2393 + 0.00026x$

What happens to the rebound of tennis balls once they are removed from the pressurized can?

- > The rebound of all tennis balls decreases over time once they are removed from the can; this is due to pressure loss. The rebound loss, however, is only 0.032" to 0.038" a day.

- Based on a 5" difference between the 58" upper spec and 53" lower spec for rebound, it would take approximately 131 to 156 days for these balls to lose 5" in rebound at 68°F and 60% Relative Humidity.
- The rate of rebound loss at 68°F and 60% Relative Humidity varies from compound to compound. Based on the slopes of these lines, the compounds can be ranked in order of least amount of loss in rebound:

- Least 1.  
2. *Confidential*  
3.  
Most 4.

What happens to the deformation of tennis balls once they are removed from the pressurized can?

- All tennis balls soften over time once they are removed from the can; this is due to pressure loss. The amount of softening, however, is only 0.00026" to 0.00031" a day.
- Based on a 0.060" range for the deformation specifications of 0.220" to 0.280", it would take 194 to 231 days for these balls to soften 0.060" at 68°F and 60% Relative Humidity.
- Based on the slope of the linear regression lines, the compounds may be ranked in order of least amount of softening at 68°F and 60% Relative Humidity:

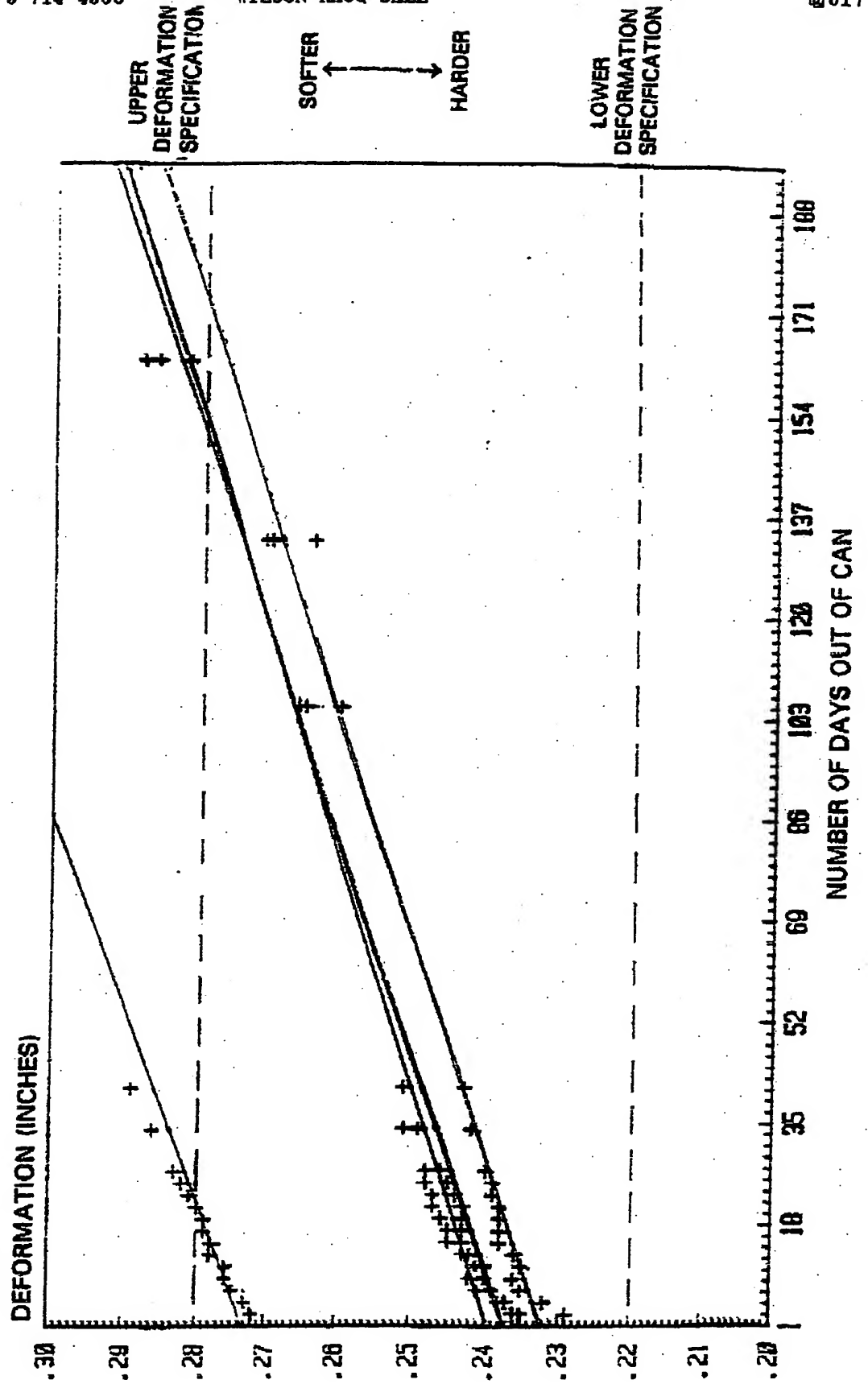
- Least 1.  
2. *Confidential*  
3.  
Most 4.

#### SUMMARY

It is important to note the initial rebound and deformation of each compound. Compounds that have a rebound near the upper limit (58.0") will remain "in spec" longer than balls that are near the median (55.5") or the lower limit (53.0"). The same discussion applies to deformation; balls that are near the "hard" side of the specification (0.220") will remain "in spec" longer than balls that are nearer the specification median (0.250").

This test does not accurately measure the life of tennis balls because, in reality, balls are taken out of the can, played and then allowed to sit in non-pressurized cans at various temperatures. The actual play time and amount of hitting will accelerate the changes in rebound and deformation. At best, this test can be used to determine how long a tennis ball is playable once the can has lost its pressure.

# LEAKAGE TEST - 68°F (LINEAR REGRESSION)



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APPENDIX  
EXHIBIT F  
PAGE F1-F2

# WEBSTER'S NEW UNIVERSAL UNABRIDGED DICTIONARY

DELUXE  
SECOND EDITION

BASED UPON THE BROAD FOUNDATIONS LAID DOWN BY

Noah Webster

EXTENSIVELY REVISED BY THE PUBLISHER'S EDITORIAL STAFF UNDER THE GENERAL SUPERVISION OF

JEAN L. McKECHNIE

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GEOGRAPHICAL AND BIOGRAPHICAL DATA, SCRIPTURE PROPER NAMES, FOREIGN WORDS AND PHRASES,  
PRACTICAL BUSINESS MATHEMATICS, ABBREVIATIONS, TABLES OF WEIGHTS AND MEASURES, SIGNS AND  
SYMBOLS, AND FORMS OF ADDRESS

ILLUSTRATED THROUGHOUT

Dorset & Baber

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xii

xiii

29

128

131

132

135

136

141

145

50

52

57

15

F-1

## felicitate

made very happy. [Obs.]  
felicitated, *pp.*; *pp.*; felicitat-  
felicitates, *pp.* of *felicitare*, to  
felicis (-icis), happy.]

happy. [Rare.]  
felicite; to wish joy or pleasure  
felicite our friends on good for-

a congratulation.  
1. suitable to the occasion;  
apt and to the point; as, a

the knack of appropriate and  
-ness, style, etc.  
felicity; as, a *felicitous* occa-

timely, apropos, successful

ade. in a felicitous manner;

2. the state or condition of

felicitous, [ME. *felicitee*;  
from L. *felicitas*, happiness, from

happy.]

perfect content and comfort;

after this life to attain ever-

and *felicity*.—Common Prayer.

which produces happiness or

source of satisfaction; as, the

eternal life.

*felicity* can genius attain than

purified intellectual pleas-

—Johnson.

of appropriate and pleasing ex-

pression, speaking, painting, etc.

pression or thought.

belonging to the cat fam-

from L. *felis*, properly *felles*, a cat.

of the cat kind, a family of

incisor teeth are equal; the

and the large canine in either

sharp, and these, the car-

teeth, work against each

in cutting flesh; the claws

retractile. This family in-

cat, wildcat, lion, tiger,

leopard, panther, cheetah,

lynx, ocelot, etc.

from *felis*, a cat.]

of the genus *Felis* or family

habits.

(a) sly; cruel; treacherous;

(b) graceful in a sleek way;

mark of the family *Felidae*.

quality of being feline.

from *felis*, a cat.] the type genus

felid.

from *fel*, OFr. *fel*, cruel, furious.]

ferocious; inhuman; fierce; sav-

from *falaha*, to cleave the soil, plow.] a peas-

ant or laborer in Egypt or some other coun-

tries where Arabic is spoken.

fel'la-ti-a, n. [Mod.L., from L. *fellatus*, pp. of

*fellare*, to suck.] a sexual activity involving

oral contact with the male genitals.

fel'ler, n. a fellow; a man or boy. [Slang or

Dial.]

fel'ler, n. 1. one who hews or knocks down; a

device for cutting down trees.

2. a sewing-machine attachment for felling

seams.

fel'lare, n. see *fieldfare*.

fel'mon-ger, n. a dealer in fells or hides.

fel'ness, n. cruelty; fierce barbarity; rage;

absolute ruthlessness.

fel'low, n. same as *felly*.

fel'low, n. [ME. *felow*, *felaghe*, a companion,

partner, from Ice. *felagi*, a partnership, fel-

lowship; *fe*, property, and *lag*, a laying to-

gether, fellowship, from *leggja*, to lay.]

1. originally, a person who shares; partner

or accomplice; hence, a companion; an asso-

ciate; a comrade; a mate.

In youth I had twelve *fellows* like myself.

—Ascham.

2. an equal; a person of the same class or

rank; peer.

3. either of a pair of similar things used to-

gether and suited to each other.

4. (a) a man or boy; often in familiar ad-

dress; (b) a person; one; as, a *fellow* must eat.

[Colloq.]

A *fellow* of infinite jest, of most excellent

fancy.

5. (a) a person of a lower social class; (b) a

coarse, rough man. [Obs.]

Worth makes the man, the want of it the

*fellow*.

6. a suitor; beau. [Colloq.]

7. a graduate student who holds a fellow-

ship in a university or college.

8. a member of a learned society.

9. a member of a governing body of a col-

lege, as at Oxford University. [Brit.]

fel'low, a. having the same ideas, position,

work, etc.; in the same condition; associated;

as, *fellow* workers, *fellow* students.

fel'low, v.i.; followed, *pt.*, *pp.*; following, *ppr.*

1. to suit with; to pair with; to match.

2. to associate with; to accompany. [Obs.]

fel'low com'mun-er, 1. one who has the

same right of common.

2. in Cambridge, Oxford, and Dublin, an

undergraduate who commons or dines with

the fellows.

fel'low-craft, n. the second degree in Free-

masonry; also, one who has taken this degree.

fel'low-feel', v.i. to have a like feeling, as sor-

row or joy, with; to feel sympathy with.

[Rare.]

fel'low feel'er, one who shares another's feel-

ings; one who feels sympathy for another.

[Rare.]

fel'low feel'ing, a feeling of fellowship or joint

interest; sympathy.

fel'low-less, a. having no equal or associate;

peerless; unmatched.

fel'low-like, a. like an associate or comrade;

companionable; on equal terms. [Obs.]

fel'low-ly, a. fellowlike; sympathetic. [Rare.]

fel'low serv'ant, each of two or more persons

who perform similar tasks for the same em-

ployer; an employer cannot ordinarily be held

liable for injuries suffered by one servant

through the negligence of another.

fel'low-ship, n. 1. the condition of being an

associate; mutual association of persons on

equal and friendly terms; communion; com-

panionship; familiar intercourse; intimate fa-

miliarity.

Have no *fellowship* with the unfruitful

works of darkness. —Eph. v. 11.

Men are made for society and mutual fel-

lowship. —Calamy.

2. a mutual sharing, as of experience,

activity, interest, etc.; partnership; joint

interest; as, *fellowship* in pain.

3. a group of companions or fellows; an

association of persons having the same tastes,

occupations, or interests; a band; a company.

The great contention of the sea and skies

Parted our *fellowship*. —Shak.

4. an endowment, or a sum of money paid

from such an endowment, for the support of a

graduate student in a university or college.

5. the rank or position of a fellow in a uni-

versity or college.

fel'low-ship, v.i.; fellowshipped, *pt.*, *pp.*; fel-

lowshipping, *ppr.* to associate with as a fellow

or member of the same church; to admit to

fellowship, specifically to Christian fellow-

ship; to unite with in doctrine and discipline.

fel'low-ship, v.i. to become associated with

others, especially in the same church.

fel'low trav'el-er, a nonmember who supports

or approves the cause of a party, especially

the Communist Party.

fel'ly, adv. [ME. *felly*, *felli*, *fellich*, fiercely;

cruelly.] in a fell manner; cruelly; fiercely;

barbarously.

fel'ty, fel'toe, n.; pl. fel'ties, fel'toes. [ME.

*feli*, *felwe*, *felow*; AS. *felg*, *felga*, a felly, fellow,

from AS. *folan*, *feolan*, to stick, from the

pieces of the rim being put together.]

1. any of the curved pieces of wood which,

joined together by dowel pins, form the cir-

cumference or circular rim of a wheel into

which the spokes are fitted.

2. the rim of a wheel.

fel'to-de-er' (or fel'to-), n.; pl. fel'to-de-er',

fel'to-neg-de-er', [Anglo-L., lit., felon of

(one)self.] in law, suicide or a suicide.

fel'told, a. [L. *feles*, *felis*, a cat, and Gr. *eidos*,

form.] of or pertaining to the *Felidae*; having

the characteristics of the cat family.

fel'on, a. 1. malignant; fierce; malicious; pro-

ceeding from a depraved heart; traitorous;

disloyal.

Vain shows of love to veil his *fellow* hate.

—Pope.

2. wicked; base; criminal.

fel'on, n. [ME. *felous*, *felon*, from *felous*,

wicked, malignant.] a painful, pus-producing

infection at the end of a toe or finger, usually

occurring near the nail; a deep-seated whit-

low.

fel'on, n. [ME. *felow*, *felous*; OFr. *felon*, *felon*,

a wicked person, traitor, from LL. *fello*, *felo*, a

traitor, rebel.]

1. in law, a person who has committed a

felony; a criminal.

2. a villain. [Rare.]

fel'on-ess, n. a woman guilty of a felony.

fel'lo-ni-ous, a. 1. wicked; base; criminal.

2. in law, of, like, or constituting a felony;

as, *felonious* homicide.

fel'lo-ni-ous-ly, adv. in a felonious manner;

with the deliberate intention of committing a

crime.

fel'lo-ni-ous-ness, n. the quality of being felo-

nious.

fel'on-ly, adv. feloniously. [Obs.]

fel'o-nous, a. wicked; felonious. [Obs.]

fel'o-nous-ly, adv. feloniously. [Obs.]

fel'on-ry, n. a number of felons, considered

collectively; a body of convicts, as in a prison

or penal colony.

fel'on-wood, n. bittersweet.

fel'on-y, n.; pl. fel'on-ies, [ME. *felony*, *felonie*;

LL. *felonia*, treason, treachery, from *felo*

(-onis), a traitor, wicked fellow.]

1. an act of wickedness or treachery. [Obs.]

2. in law, (a) under the feudal system, an

offense committed by a vassal, the penalty

for which was forfeiture of fief; (b) at com-

mon law, one of a limited number of crimes

the punishment for which is the forfeiture of

land or goods or both (cases of particular

heinousness sometimes occasioning additional

penalty, even death); (c) in modern usage, a

major crime, as murder, arson, rape, etc., for

which statute provides a greater punishment

than for a misdemeanor.

In many [states] of the United States, *felony*

is defined by statute as including all

crimes which are punishable by death or

imprisonment in the state prison.

Many crimes which were not *felonies* at

common law are made so by statute, being

either expressly declared to be so, or such

a penalty being attached to them as to

bring them within the meaning of the

term.

fel'site, n. [from *felspar*, and *-ite*.] an igneous

rock consisting mainly of feldspar and quartz;

also called *felstone*.

fel'sit'ic, a. pertaining to or resembling felsite;

containing or composed of felsite.

fel'spar, fel'spath, n. same as *feldspar*.

fel'spath'ic, a. same as *felspathic*.

fel'st'one, n. same as *felstone*.

felt, v. past tense and past participle of *feel*.

felt, n. [ME. *felt*; AS. *felt*; D. *vilt*; G. *fil*, *felt*.]

1. a cloth or fabric made of wool, or of wool

and fur or hair, the fibers of which are not

woven together, but matted or wrought into

a compact substance by rolling and pressure,

usually with the aid of chemical action, heat,

etc.

2. —

3. —

4. —

5. —

6. —